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LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLVI. No. 3051.] LONDON, NOVEMBER 2, 1921. [73rd Year. Price 1s.

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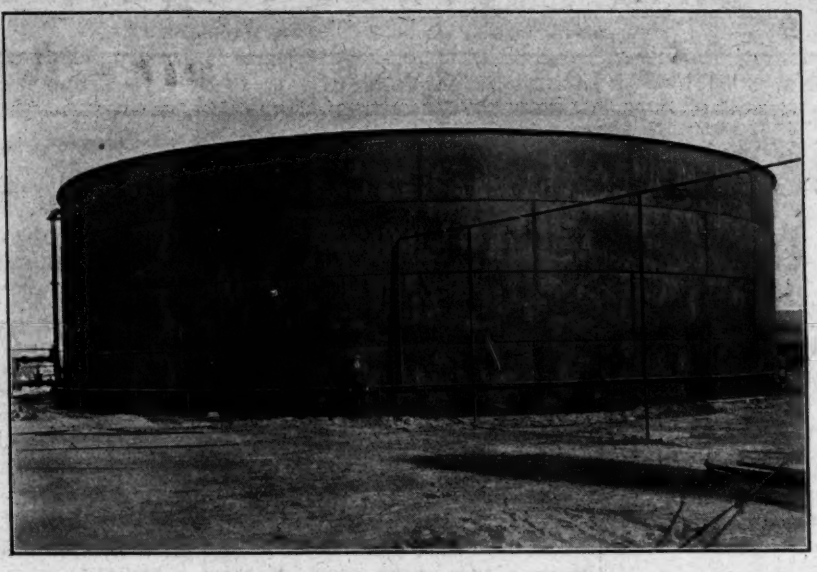

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CLVI., No. 3051.] WEDNESDAY, NOVEMBER 2, 1921. [73RD YEAR.

EDITORIAL NOTES.

Sliding-Scale for Gas-Workers' Wages.

AN agreement for the regulation of the wages of gas workers by means of a sliding-scale based on the cost of living has now been reached; and it is the decision of the Joint Industrial Council for the Gas Industry on which are represented both employers and employed. A definite slide has been arranged; so that there should be no disagreement as to wages in the industry for some time to come—at any rate, in all cases where there is loyal obedience to the agreement that has been arrived at. As a permanent basis for the regulation of wages, we are not particularly enamoured of sliding-scales based upon the cost of living. Theoretically, the cost of living cannot be classed as one of the factors that has anything definitely to do with the economic conditions of industry. At the same time, in the abnormal conditions under which industry exists in this country to-day, the sliding-scale may well be, and in certain industries probably is, the best method of settling the vexed wages question for a period of time. It will be observed that, under the agreement in question, the National Joint Industrial Council for the Gas Industry has adopted this view. Provision is made whereby either party can give three months' notice in writing on March 31, 1922, or else on any subsequent quarter day, or by one month's notice when "the average cost-of-living figure for any three "months' period falls below 70." There is every indication that from now onwards the cost of living must fall sharply, and to a considerable extent. The difference between the wholesale and retail index figures is itself a strong confirmation of this fact.

We think that, generally speaking, gas undertakings will welcome this arrangement for the reduction of wages, and will come to the conclusion that the scheme proposed is an equitable way out of the present difficulties for both employers and employees. The terms are undoubtedly quite as satisfactory for both sides as the schemes which have been propounded for any other industry, bearing in mind the fact that the permanent basis on which wages are to be settled has not been dealt with. The sliding-scale agreed upon provides for changes in the rate of pay for every variation of six points in the cost of living—to be calculated from the cost-of-living figure of 128. The first reduction is to take place on Nov. 7; and, as the average cost-of-living figure for the three months ending August is 120, there will then be a reduction accordingly. For every complete six points variation in the average of the cost-of-living figures calculated over a period of three months, the slide provides for a reduction of ½d. per hour for day workers and 4d. per shift for shift workers, in the case of men of 18 years of age and upwards. In addition to the foregoing, undertakings which are entitled to do so will, as each reduction is made under the sliding-scale, deduct the 12½ p.ct. and 7½ p.ct. bonuses thereon, in the case of men of 21 years of age and upwards. The next adjustment under the sliding-scale will be settled in December on the average of the cost-of-living figures for September to November; and any variation in wages will come into operation in January.

We have heard of one or two complaints on the part of gas men who feel some grievance that they were not consulted before the agreement was entered into. We feel, however, that any discontent there may be in this respect is not deep-rooted. Apart from the fact that there were representatives of undertakings from every district dealing with this matter, there were other good and sufficient reasons for not making inopportune disclosure of the proposals. We remember the unauthorized strikes that took place in 1920 after the last wages increase settlement. How much injudicious and premature statements by gas managers were responsible for part of these eruptions, it is not our business to say, even if we could do so. But that statements made in such quarters did have a bad effect among workers in certain areas, is beyond doubt. In these matters, it is always better that the leaders of the men should put the information before them in their own way; and there was a pledge that on this occasion there should be no disclosure until the leaders had done this, and had got the agreement on to a firm basis. The pledge was a politic one.

Gas Production in Rotary Retorts Internally Heated.

THERE are men who have asserted, perhaps somewhat dogmatically, that carbonization of coal at low temperatures will never be applied to the production of gas for town purposes. After reading an article in later columns of this issue, the particulars for which were handed to us by Mr. Harald Nielsen, these men may be disposed to recede in some measure from their confident attitude, as the plant and process (of which he is the inventor), together with the results that are presented, at all events hold out new possibilities, which have attracted the attention and consideration of several competent men. As the result of investigation, too, Sir George Beilby and the Board of Fuel Research appear to be persuaded that low-temperature carbonization is not likely to succeed commercially carried out on the lines along which there has hitherto been work with much assiduity for a considerable length of time. Mr. Nielsen has departed completely from the old lines, and has adopted new ones—a slowly revolving retort and internal heating with a gas free from oxygen being fundamental principles in his system. The rotary retort is the necessary accompaniment of the internal heating to secure the highest efficiency; and a very high over-all carbonizing efficiency is secured, through the heat being utilized with marked thoroughness. If the inventor is going to make town's gas, he precedes the slightly inclined rotary retort by a water-gas generator; and the gas from the generator enters the retort at a temperature of some 800° C., and the mixed gas passes from the other end of the retort at a temperature of only 120° C. If he is making smokeless fuel and poor calorific power gas, he uses producer gas for the heating of the retort charge. There is a considerable saving in fuel from this internal heating with gases compared with the external heating of the retorts, as is the plan pursued with most well-known low-temperature processes of carbonization. And the high effective use of the heating gas is obtained by the slow rotation of the retort, which throws over the coal when it reaches the limit of the angle of repose. The coal or slack undergoing carbonization only occupies (say) one-fifth of the retort capacity, the other four-fifths being the heating space, in which the surface of every particle of the charge meets the hot incoming gas which brings about its carbonization. One can readily appreciate the economy of using inside retorts the heat of water gas for carbonizing purposes, seeing that, properly made, it is practically all combustible, and therefore usable gas. Allowing for the steam requirements of the producer or generator, and its thermal efficiency, the heat required to carbonize the coal is approximately 6 or 7 p.ct. of the heat value of the coal distilled, which is about one-half that in present external heating practice. The retorts by the way may be constructed to deal with any quantity of coal from a few tons per day each up to (say) 100 tons. The one

illustrated by the diagram in the article later in this issue represents a 10-ton retort.

It is the system for the production of town gas that interests us most; and Mr. Nielsen describes this as "combined low-temperature distillation and complete gasification for the production of high calorific power gas"—the "high" meaning 380 to 400 B.Th.U. gas. There are also rich tar oils and a quantity of sulphate of ammonia produced. One thing that is missed from the figures in which we are particularly concerned is an analysis of the gas and tar. But regarding the gas, it is fairly obvious that if the water gas is produced of good quality, low in carbon dioxide, the mixed gas issuing from the retort should only contain a small percentage of incombustibles. It appears that, with the working of the system in the way that most interests us, and with coal possessing a calorific value of 25,536,000 B.Th.U. per ton, 36,000 c.ft. of saleable gas of 380 B.Th.U. are produced, which means 13,680,000 B.Th.U., or 136·8 therms, or 53·5 p.ct. of the heat of the coal. Besides this (we gather) 70,000 c.ft. of 110 B.Th.U. gas, or 7,700,000 B.Th.U., are produced, which can be used for any industrial purpose—Mr. Nielsen contemplates its use for electricity generation. Adding the heat figures together, we get a total thermal efficiency of conversion, allowing for the heat required for the steam for the water-gas generator, of 80 p.ct. It will be seen that the process is practically automatic; and therefore the labour required is low. In fact, one man for a unit of the gas-producing plant, one man for the remaining plant, and one man for the sulphate of ammonia plant suffice.

According to the inventor's calculations, the cost of treating 1 ton of coal is 5s., to which has to be added the cost of the coal. The inventor, in order to be on the safe side, is modest in his credits for bye-products. Among the credits are the tar oils, sulphate, and electricity (another set of calculations apply where solid smokeless fuel is produced). It has been seen that the secondary low-calorific grade of gas produced is equal to 7,700,000 B.Th.U.; and Mr. Nielsen, calculating upon a KW.-hour being generated for 30,000 B.Th.U., takes credit for 256 KW.-hours per ton of coal as a bye-product. The 30,000 B.Th.U. is quite a good efficiency, seeing that many electricity stations are to-day using 4 or 5 lbs. of coal per KW.-hour. The total cost of generating 1 KW.-hour is put at 0·25d.; so that, if the electrical energy be sold at 1d. per unit (many electrical men would be glad enough to have current flowing into their cables at that figure to-day), the revenue, less cost, on the 256 units generated would be 16s. To this have to be added credits for the other secondary products, for the details of which the article elsewhere must be consulted. Taking the figures as they are presented to us, on the assumption that the coal costs £1 a ton, the 36,000 c.ft. of 380 B.Th.U. gas are produced at 1·5d. per 1000 c.ft., or 0·4d. per therm. If the coal costs £2 5s. per ton, the cost per 1000 c.ft. of the 380 B.Th.U. gas works out at 9·84d. per 1000 c.ft., or 2·6d. per therm. This is all very good. Added to this, when by a complete gasification plant of another type, we are promised (the promise has yet to be the subject of proof) some 220 therms for sale per ton of coal handled, it will be seen that we are approaching exciting times. It is not, however, the total therms for sale per ton of coal that will necessarily govern the situation; it will be the net cost per therm into the holder, and the figure at which the therm can be sold. The article in other columns says nothing about capital costs; but we are assured that these are low in relation to capital costs for ordinary carbonizing plant with external heating.

The article also deals with the production of solid smokeless fuel and low-grade gas by using producer gas as the internal heating medium. The gas yield is 44,000 c.ft. of 233 B.Th.U., or in all 10,252,000 B.Th.U. The solid fuel is manufactured by consolidating the breeze by using the pitch made. There are also the tar oils and the sulphate of ammonia. The over-all efficiency of the plant under this process is put at 92 p.ct. Slack or any kind of poor coal may be carbonized in the retort. It is, however, easy to see that, using a rotary retort, a solid smokeless fuel cannot be produced without an auxiliary agglomerating process. Even this may pay. Time and experience alone can give the proof. In the well-known low-temperature processes hitherto put under trial with retorts or carbonizing chambers externally heated, the ambition of their inventors has been so to construct that the smokeless fuel is produced direct in a physical condition fit for the market. In this there has been much failure and little success. The difficulties in carbonizing and discharging, particularly with highly bituminous coals, have been great, and so have been the labour and heating costs in relation to the work done. There is one thing that can be admired, and it is the remarkable perseverance of the low-temperature people in trying to realize success. But so far, if Mr. Nielsen's statements and calculations are borne out by working experience, as a low-temperature proposition for town-gas purposes his system has the best complexion of any yet presented. At the same time, the system will have to take its place competitively with others. The fittest will survive; and experience must be left to determine the issue as to which is the fittest.

Therm Production Policy.

MANY gas undertakings, if they were to-day named on the heat-unit basis, would have to be called coke, and not gas, undertakings, for the proportion of potential heat energy they sell in the form of coke is about two-and-a-half times that of which they dispose in the form of gas. This is an anomalous condition. Gas undertakings were established to supply gas and incidentally coke; but the fact remains that there are more heat units going from many works in the form of coke than in that of gas. Mr. Frank H. Robinson, of Harrogate, at the meeting of the Manchester Institution on Friday, addressed himself in a paper to the question of the manufacturing policy a gas undertaking should pursue under the order of things created and established by the Gas Regulation Act. The contribution was composed in the form it was with the idea of eliciting the views of members, and not necessarily to be taken as representing the pronounced opinions of the author. But we shall not be much adrift from the truth when we say that the case he presented to members for transferring more of the therms from the coke to the gas is so good that it is the policy he has fully accepted, and intends to follow as opportunity permits. When we look at the distribution of the B.Th.U. after treatment of the coal as still practised to such a large extent, and see that of the calorific value of the coal (speaking approximately) only 6,500,000 B.Th.U. are in the form of gas, 15,500,000 B.Th.U. in the form of coke that can be burned with less efficiency than gas, and 2,000,000 B.Th.U. in the form of tar, then to-day common sense pleads stronger than ever for the transfer of at all events a substantial proportion of the 15,500,000 B.Th.U. in the form of coke to the B.Th.U. in the form of gas. Moreover, the smaller the reliance there has to be upon the purchase, conveyance, storage, and handling of coal in relation to the gas business done, the better the security of a concern.

In his paper, Mr. Robinson did not discriminate as to plant for utilizing a larger part of the raw material for producing therms in the form of gas. Not having experience of the steaming of vertical retorts, he omitted this system from the comparisons (though mentioning it), and left it to others to give to it proper place in the comparisons. The figures already quoted—the 6,500,000 B.Th.U. for straight coal gas and the 15,500,000 B.Th.U. for coke—are merely taken as basic ones for fairly common horizontal retort working; and another basic figure is that a fair thermal concentration to which to work in these days is, in the author's opinion, 460 B.Th.U. The figure for straight coal gas already named gives 65 therms for sale. To reduce this gas to 460 B.Th.U. per cubic foot, a quantity of 280 B.Th.U. water gas equal to 50 p.ct. of the coal gas, or 33·3 p.ct. of the total mixture, may be added; and this will raise the 65 therms to 81·5 therms per ton of coal—an increase of 16·5 therms, at the sacrifice of 1½ cwt. of coke for sale. If a 370 gas from complete gasification plant is made for dilution; and equal volumes of the 550 and 370 B.Th.U. gases are added together, a 460 B.Th.U. gas results. But the result is 88·3 therms for sale per ton—an increase of 23·3 therms, with a sacrifice of 2 cwt. of coke. The fuel market does not suffer from this exchange, because the increased heat energy can be used with greater efficiency than the heat energy of the extra 2 cwt. of coke that is expended per ton of coal carbonized—the gas being capable of use, according to purpose, at 50 to 75 p.ct. efficiency, as against (say) 20 p.ct. for the coke. Supposing the coal is all completely gasified—in the first place in two processes. In the coal gas there would be 6,500,000 B.Th.U., in the water gas 9,100,000 B.Th.U., and in the tar 2,000,000 B.Th.U.—a total of 17,600,000 B.Th.U. In complete gasification in one stage, 22,000,000 to 24,000,000 B.Th.U. can be obtained in

the total products, of which 18 to 19 millions are in the form of gas. Of course, whether or not there is coke for disposal depends upon the quality of the gas—whether it is thermally of high grade or low grade. If the plant is regulated for 460 B.Th.U. gas, there will be 2 cwt. of coke for disposal. However, in what has been already noticed, Mr. Robinson has shown that the percentages of heat turned out in the form of gas, relative to the calorific value of the coal, are by the systems referred to 21·6 p.ct., 27·2 p.ct., 29·4 p.ct., and 60 p.ct.

As gas undertakings have to sell on the therm basis nowadays, it is necessary to get out all costs on the therm basis. To calculate on volume is utterly misleading; and this is seen in the paper. Taking coal, coke, and tar only, the costs per therm in the four systems are respectively 3·1d., 2·9d., 2·8d., and 2·19d. Between the lowest and the highest figures per therm—those for complete gasification and straight coal gas—there is a difference of 0·91d.; but when the 0·91d. is multiplied by the large number of therms for sale per ton of coal, it comes to a substantial sum. This, however, is not the whole of the tale. There are the relative capital and labour charges, which have to come into the reckoning. They are much lower per therm as between straight coal gas and the other systems, including complete gasification.

From what has been said is clearly seen the economic advantage of the policy of transferring to the gas more of the B.Th.U. resident in the coke made in the straight coal-gas process. Apart from price, it is an economic advantage to the consumer; for the carbon monoxide (which requires a small supply of air for combustion) gives to the flames greater radiating power, the flame temperature is higher, and the flames better fitting than those produced by gas rich in hydrocarbons which cause the flames to struggle for air to complete combustion. There we have a reason why the gases of lower thermal concentration are found to give as excellent results as gases of higher thermal concentration. In other words, it helps to explain what appears to some to be pure nonsense, that a gas of low calorific power can do as much, if not sometimes more, work than gas of higher calorific power. It all depends on the character of the flame; and whether or not it is suitable to its auxiliary mantle, radiant, or whatnot in rendering the required service. The consumer has a direct interest in gas of proper character being supplied for the work it has to do.

The outcome of Mr. Robinson's investigation on the subject is that he is "satisfied that, when selling on the therm "basis, it is essential to gasify as much as possible, to get "the therms into the holder." We will not lay this down as a generally acceptable principle, though it coincides very much with our own views. It is a principle that should be examined in connection with every undertaking; and in most instances it will be found to apply. The author makes out quite an excellent case on economical and commercial grounds. We are anticipating that the time will come when some of the small gas-works will be selling therms, and precious little of anything else, and will be doing so at a less price per therm than many undertakings who go on in the old way, making straight coal gas, and are subjected to the fullest extent to the fluctuations of the markets for coke and other secondary products.

Efficiency and Standards.

THE doctrine of efficiency in all things in the gas industry is growing. Men who are progressive are talking about it, are considering it, and are developing and applying it, because they realize that, if it pays in one direction, it will pay in all. And it does pay. General principles in this regard, however, cannot be utilized for the development of specific standards that can be universally adopted. Circumstances and material are factors in formulating standards; and circumstances and materials vary everywhere to the confusion of universality. This is made very clear in the paper which Mr. H. D. Madden submitted at the meeting of the Wales and Monmouthshire Institution last Thursday. It was a paper supplementary to the one that he read some sixteen months ago; and the supplement was necessary through the passing of the basis of gas operations from volume to therm. South Wales gas coals, for example, are low in volatile matter compared with the coals from other areas; and Mr. Madden is anxious that the gas engineers of the district should carefully investigate their carbonization work under their own conditions, and then should systematically pool the information, in order to ascertain the best standards of working conditions and results with any given coal. Such directive information would be valuable not only in day-to-day operation, but in making selection of plant and processes for dealing with each class of coals, and getting the maximum results in therms and bye-products. A new set of conditions has arisen through the advent of the therm. The volume idea has to be sunk; and work has to be on those lines that will result in the best economic production of therms. Some engineers are inclined to belittle the idea because the meter still reigns and registers in volume. But the meter is only a means to an end; and that end is to ascertain the therms supplied to consumers, no matter the volume or thermal concentration per cubic foot. Therms are what all gas undertakings are going to be paid for in future.

Therefore it is that everything must be studied and efficiency be realized from the point of view of the therm, and the cost per therm to the consumer. Mr. Madden particularizes the factors that conduce to working efficiency in the plant itself; and he emphasizes the point that efficiency can only be obtained and maintained by efficiency in the methods of supervision and control. For this purpose there must also be efficiency in the supervising staff. It is really remarkable how some engineers devote themselves with scrupulous care to the selection of plant, and pay less heed to the selection of men under whose constant control the plant is to be placed. It is curious also how so many men in works of varying magnitude down to quite small ones completely ignore the fact that skilled chemical supervision pays by the value of the economies effected from preventable waste, and the improvement in results from fuel used to the ultimate gallon or pound of vendible product. The aggregate of gain will pay the salary of a trained man; the aggregate of loss through fluctuating results and working may mean the loss over and over again of the equivalent of the salary of such a man. But the only real working standards an engineer can apply are those derivable from his own conditions. He can utilize general principles, but he cannot borrow standards from even a neighbour, because of variable circumstances.

Regarding the recovery of waste heat, Mr. Madden touched on the use of the waste-heat boiler in connection with vertical retorts, and incidentally mentioned that his Company were incorporating a waste-heat boiler in an extension of water-gas plant, and the generator is to be supplied in such a way that the steam is not unduly cooled by cold coke. There is an obvious advantage in this; and a greater advantage if the coke can be supplied direct from the retorts in an incandescent state. There were also references to efficiency in distribution, and efficiency in consuming appliances, with advocacy in this latter connection of an appliance test room in which all apparatus could be tested and regulated to suit the local gas supply.

The paper is an unpretentious one; but there is much sound advice in it. The advice offers the prospect of illimitable gain through the raising of the standards and so the efficiencies in all departments of every member of that great embodiment which we call the gas industry.

The Way of Economy for Small Works.

THE time has passed when the managers of the smaller gas-works have to sit and bemoan a fate which tied them to the old conventional practices that threatened for ever to prevent them working economically, and selling gas at rates more in the region of those charged by better circumstanced undertakings. As we have said in another article, the time may now come when the small gas-works may be charging less than the larger ones. The Gas Regulation Act is a good friend to the manager of a small gas-works; and there is no lack of plants now whereby he can save coal costs, and yet increase his make of therms for every ton of coal that reaches him. He can have a simple water-gas plant with which to deal with a proportion of his coke from horizontal retort working, or he can adopt complete gasification, and reduce his costs considerably. To a large extent with these small concerns, it is a question of money to-day; but even with small works, good policy should dictate every effort being made to secure money the expenditure of which would pay, hand over fist, through resulting economies. One of the plants that is making its way into the smaller gas-works is the "Simplex" water-gas set, a paper on the adoption of which at Chepstow was read by Mr. E. Linsley, at the

meeting of the Wales and Monmouthshire Institution last week. We have had accounts of the working of this plant before. It is simple and efficient, and requires little supervision. Experience with it has led to improvements, in one respect by the adoption of the "Sydenham" grate, which has replaced the step-grate, which superseded the ordinary one. What Mr. Linsley says about this grate only confirms what we have heard in respect of it from other quarters. Clinkering troubles have been eliminated, even when coke from an inferior grade of coal is being used; and the fire only requires pricking-up at intervals of two to four hours. Therefore labour is lightened. The paper contained one defect; and it is that insufficient information is given to ascertain the over-all efficiency of the plant. No mention is made of the fuel required for the steam for gas making, driving the fan, and the atomizing of the tar for enriching the gas. But the figures that are given are sufficient to satisfy that the working is good, whether in respect of gas production or quality. A make of 53,800 c.ft. of 340 B.Th.U. gas per ton of coke means 182·9 therms; while a ton of coal, carbonized in horizontal retorts, will only give from 60 to 70 therms. Assuming that the coke has a calorific value of 11,500 B.Th.U., the gasification efficiency would be 71 p.ct. But there is lacking, as previously said, the information as to the deductions to be made from this in respect of fuel. From a three (sixteen-hour) days' test at one gas-works, to which reference is made in the paper, there is other interesting confirmatory information. But, again, a little more detail would have been useful. In the period, 83,300 c.ft. of gas were made, of which 48,600 c.ft. were coal gas, and 34,700 c.ft. water gas—the latter being 41·6 p.ct. of the total. The respective calorific values are not stated. If we assume the coal gas was of 520 B.Th.U., then we get the expenditure of 81·2 cwt. of coal giving 252·7 therms, while 12 cwt. of the coke made (assuming the tar-enriched water gas to be of 340 B.Th.U.) supplied 117·9 therms. Between 25 and 26 cwt. of coke would supply as many therms in the form of gas as the 81·2 cwt. of coal. The analysis of the gas is good, showing a total inert content of less than 10 p.ct. There are lessons in the figures in this article, as in those which have been derived from the working of other plants, which point the way of economy for small works in these days of expensive coal and labour.

Revised Model Clauses.

The new model clauses for Gas Bills are reviewed in our "Parliamentary Intelligence" to-day. For the most part, they are the same as before; but there are changes in those referring to charges by the conversion of "1000 c.ft." to the "therm" basis. Heating value, quality, pressure, and kindred matters are now excluded; being dealt with by Orders under section 1 of the Gas Regulation Act, 1920, the mention of which Act occurs for the first time in the Model Clauses. Two or three other omissions are observed; but there are fresh introductions which are noted in our review, together with a few clauses common in modern Gas Acts, but not previously incorporated in the Model Bill. The clauses will now probably be handled more in connection with applications to the Board of Trade for Special Orders than in connection with promotions for Acts, for the popular route to gas legislation will in future—at least this is our opinion—be the former and not the latter, more especially as the Gas Acts passed this session show that Parliament intends that much more than hitherto shall be left to the determination of the Board of Trade.

Gas Coal Position.

There is still evident a feeling that gas coal prices will fall to a lower level; and, in view of this, gas undertakings are still pursuing the cautious policy that was adopted immediately after the determination of the miners' strike. From the colliery districts, it is reported that there is no improvement in this particular market, which means that neither the demand nor the prices are such as the colliery owners would like to see. As a matter of fact, there has been some further decline in the prices of the various sorts in Northumberland and Durham. To some extent this is no doubt due to the preference which many gas engineers are showing for coals differing somewhat in physical characteristics from those of the more Northern English areas. From Yorkshire, for instance, the report comes that gas-works are still taking, as they have been doing for some weeks past, fairly good deliveries at current prices. But in regard to that area the same condition applies as to other areas, that gas undertakings are not buying forward to any very large extent. It is true the consumption of coal by gas-works is steadily growing, as advance is made to winter; but the general trend of policy to-day is only to buy enough for current consumption, with a little surplus which goes to augment stocks, and, without affecting the latter, will meet any exceptional flights in gas demand. But, generally speaking, the requirements are on a reduced scale compared with (say) a couple of months ago, when the work of stock restoration was in full swing. It is also learned that gas coke is a little easier, owing to larger quantities coming on to the market.

The Engineers' Ballot.

Relying so much upon the engineering industry for supplies, the gas industry will have learned with satisfaction the result of the ballot of the engineering and shipbuilding workers regarding the employers' proposals for the withdrawal of the war bonus of 12½ p.ct. to skilled workers, and of 7½ p.ct. to semi-skilled and unskilled men. For acceptance, there were 170,471 votes, and 147,636 against—a majority in favour of 22,835. The abstentions were high. The bonus will be withdrawn in three equal amounts on Nov. 1, Dec. 1, and Jan. 1. The bonus was originally given for a special purpose during the war. This purpose no longer exists, and in addition there must be relief to the costs of production; otherwise more and more trade will be lost, and unemployment will become more severe.

Reviving Electrical Trade.

The Joint Industrial Council of the electricity industry, the Electrical Manufacturers and Wholesalers, the Cablemakers' Association, the Electrical Development Association, and the various trade unions have had a combined conference, and have agreed collectively to take steps to stimulate electrical development at home, and, under a system of mutual reductions, to compete for contracts abroad and in the Overseas Colonies. A good feature of the conference was that the workers' representatives expressed their willingness to co-operate in any schemes which would lead to a revival of the industry, and promised to encourage the workers to put forward their best endeavours to that end. Procedure to realize the desired end is being taken in hand in a methodical manner. To work out the details and supply information on schemes, sub-committees have been appointed, and another conference is to be held this week. This is to be followed by submitting the full facts to the Cabinet, and inviting the Government to assist the industry in its endeavours to encourage fruitful development. There is confidence, it is said, that, with financial assistance and labour's good will, a "great revival" in the industry will take place.

Forks and Shovels Battle.

We hope the coalowners will not temporize with the question of filling with forks instead of shovels. A more opportune time there could not be than the present conditions offer for persisting in abandoning the shovel and reverting to the fork. The matter has now become acute in Nottinghamshire, Derbyshire, and Leicestershire. The miners are resenting the change. In the pits of the Blackwell Company (Derbyshire), the men have decided to accept a reduction of 1d. per ton on the basic rate, subject to the filling by shovels being retained. The Company have provisionally agreed to the arrangement. We hope it is only a provisional agreement which will be quickly terminated. What is 1d. per ton compared with the percentage increase in the refuse sold as coal? The question is a consumers' one; and they ought to make themselves felt in any decision arrived at.

Masonic.—Alderman William Kay, the Mayor of Manchester and Chairman of the Manchester Corporation Gas Committee, has been appointed Senior Grand Warden for East Lancashire.

Gas Companies' Protection Association.—The annual meeting of the Association is to be held at Caxton Hall, Westminster, next Wednesday, Nov. 9, at 3 p.m., when the report and accounts for the past year will be submitted.

The Tully Gas Paper before the Scottish Juniors.—Unfortunately, owing to a misunderstanding, we did not receive in time for inclusion in this number of the "JOURNAL" the copy of Mr. A. M'Donald's address to the Eastern District Section of the Scottish Junior Gas Association, recounting his experiences with a Tully gas plant. The address will be given next week.

PERSONAL.

Mr. H. D. GREENWOOD, M.Sc., who has just completed a four years' training at the University of Leeds, and obtained first-class honours in Gas Engineering, has been appointed Technical Assistant to Mr. F. G. Shaw, Engineer and Manager to the Buxton Corporation Gas Department. Mr. Greenwood went to the University from Skipton Grammar School with an entrance scholarship, and was last year awarded a University Scholarship in order to enable him to give a year to research training. During this time he has assisted in certain research work carried out into the structure of coke, and on the loss of ammonia by oxidation in carbonization and gasification. He has had vacation work experience at the Keighley and Bournemouth Gas-Works.

Mr. J. F. FOWLER, of Newcastle-on-Tyne, has been appointed Outside Superintendent at the Accrington Gas-Works in succession to Mr. H. Roberts.

OBITUARY.

WILLIAM RICHARDS PHILLIPS.

Deep and widespread regret will be felt at the death, which occurred last Thursday, of Mr. W. R. Phillips, J.P., the octogenarian Secretary and Manager of the Luton Gas Company and other undertakings. Business was the late Mr. Phillips's hobby; and almost up to the last moment he remained in harness. As recently as Tuesday of last week he was at work at the offices of the Company; and though suffering from a bad cold, he could not be persuaded to remain at home. Bronchitis, to which he was subject, supervened on Wednesday. From this he rallied a little; but eventually the heart failed, and thus a long, useful, and busy career came to an end.

Mr. Phillips, who was eighty-five years old leaves two sons and two daughters (his wife having predeceased him several years), and with them much sympathy will be felt in their great loss. The foundations of his career as an engineer were laid in London; and after a successful sojourn at Hatcham, and later at Bow Common, where he learned gas engineering, he went into business on his own account. It was in the early seventies that Mr. Phillips joined his father in the engineering work and general managership of the Luton Gas Company and also of the Hitchin (Herts.) Gas Company. Subsequently, in 1882, he was appointed Manager and Engineer of the Luton Water Company; and in 1889, on the death of his father, he succeeded him as Engineer, General Manager, and Secretary of the Luton Gas Company. He also succeeded to his father's position at Hitchin, and was later appointed Manager and Secretary of the Stevenage Gas Company. In addition to these offices, he was Engineer to the Harpenden Water Company. He was originally Supervising Engineer to the March and Ampthill (Beds.) Gas Company. For some years he was a member of the Luton Town Council; and to the members of this body his technical knowledge was of great value. Years since he was a very prominent Freemason; and his initiation took place as long ago as 1863. The funeral took place on Monday last; a service being conducted at Christ Church, Luton. There were many manifestations of public sympathy from well-known public men of the town and district.

GAS WORKERS' WAGES ON A SLIDING-SCALE.

An Agreement Based on the Cost of Living.

AN agreement has been arrived at by the National Joint Industrial Council for the Gas Industry, whereby the wages of gas workers are to be regulated on a sliding-scale basis. Under the terms of this agreement, the first reduction takes effect from Nov. 7; and it is based upon the actual cost of living figures for the months of June, July, and August this year, as published in the "Labour Gazette." The average of the cost of living figures for these months was (ignoring decimal points) 120.

The agreement (which was concluded on Oct. 26) is as follows:

That a sliding-scale of a halfpenny per hour for every complete variation of six points in the cost of living index figures be adopted. The slide to commence at the figure of 128, and the first reduction to be made on and from the 7th of November, 1921, and to be based on the actual cost of living figures for the months of June, July, and August, 1921. The following adjustments to be settled in December upon the actual cost of living figures for September, October, and November, 1921, and to come into operation in January, 1922. Each full six points only to be calculated; and wages to be adjusted on the average figure for the preceding three months. Any adjustments in wages to carry the 12½ p.ct. bonus proportionately. Either side to have the right to terminate the agreement either—

(*a*) By giving three months' notice in writing on the 31st of March, 1922, or thereafter by three months' notice in writing expiring on any subsequent quarter day; or

(*b*) By one month's notice in writing, to be given on either side if the average cost-of-living figure for any three months' "period" falls below 70.

In pursuance of this agreement, notice of the first reduction on Nov. 7 will be given to workers in the case of undertakings entitled to deduct the 12½ p.ct. and 7½ p.ct. Ministry of Munitions bonus as follows:

(1) *Workmen of 21 Years of Age and Over.*

(*a*) Shift workers	4d. per shift, *plus* 12½ p.ct thereon.
(*b*) Day workers and other gas workers other than shift workers or piece workers . .	½d. per hour, *plus* 12½ p.ct. thereon.
(*c*) Piece workers	A corresponding reduction, *plus* 7½ p.ct. thereon.

(2) *Workmen of 18 Years of Age and Under 21 Years of Age.*

(*a*) Shift workers	4d. per shift.
(*b*) Day workers and other gas workers other than shift workers or piece workers . .	½d. per hour.
(*c*) Piece workers	A corresponding reduction.

Notice will be given of the first reduction on Nov. 7 to workers in undertakings not entitled to deduct the 12½ p.ct. and 7½ p.ct. Ministry of Munitions bonuses, as follows:

Workmen of 18 Years of Age and Over.

(*a*) Shift workers	4d. per shift.
(*b*) Day workers and other gas workers other than shift workers or piece workers . .	½d. per hour.
(*c*) Piece workers	A corresponding reduction.

ELECTRICITY SUPPLY MEMORANDA.

Statutory Wiring Powers Proposed.

ELECTRIC wiring installations are good, bad, and indifferent; and even those that come under the first designation are known not to be proof against mishap. There have been many attestations of this of an uncomfortable order; and therefore the bad and indifferent should be ruthlessly ruled-out—if it is possible. The times have come when wiring is very expensive; and therefore the greater is the temptation to cut-down safety to gain cheaper installation. Competition is partly accountable for this; the desire to get business by wiring contractors is another reason; and still a further cause is the wish of electricity suppliers to push their business into a lower zone of dwellings. There are those who see that the craze for cheaper wiring than the best bodes no good for the electricity supply industry; that in the long-run the influence of shoddy installation work will recoil upon the supply industry, and have a very bad effect. We rather think the Council of the Institution of Electrical Engineers are of this way of thinking; for it is learned from "Electrical Industries" that they have passed a resolution recording their opinion that those electricity undertakings which desire it should have statutory powers conferred upon them to enforce a set of national wiring rules. The question is to be relegated to a Special Committee on which every Association interested is invited to be represented. This shows that the Council of the premier electrical organization is of opinion that national standard wiring rules are desirable. This fact cannot be pushed aside as the mere view of a set of irresponsibles. Our contemporary is against the Council; and, as we read its comment, it strikes us that it is opposed to electricity undertakings shouldering any responsibility at all in respect of internal wiring. It sees additional installation expenses resulting from statutory enforcement; and it prefers the flexibility of the present system which allows whatever class of installation is preferred, for reasons other than the primary one of safety, to be put in by any contracting Tom, Dick, or Harry. In the gas industry a very decided movement has set-in for obtaining powers by undertakings to prescribe internal piping, and to have supervision over it during installation—not so much with the idea of ensuring safety (as is the case with electrical installations), as to ensure capacity. Our contemporary thinks that if the Institution really wants to perform a valuable service in connection with wiring, it should take up the question of a standard wiring system, seeing that the present multiplicity of systems is fatal to economy. Supposing they do this, there must be means of enforcing it, or there will be as much evasion as there has been of the existing wiring rules of the Institution.

Lighting Business and High Gas Prices.

The Director of the Electrical Development Association (Mr. J. W. Beauchamp) is a busy man to-day. He is scattering advice freely among electricity undertakings as to what they should do in the present conditions of business. He is most particularly anxious that his sage counsel should reach the eyes of the electricity undertakings where the price per unit is still between 8d. and 1s., and gas has taken flight beyond 4s. 6d. or 5s. per 1000 c.ft., and that they should do all they can to assist in wiring schemes for lighting, in view of

the fact that, when once lighting gets in, there are several of the smaller electrical domestic uses that can be put on to the lighting circuit, and revenue for them be reaped at the lighting rate. He seems to be of the opinion that it is the cost of installation only that, in such cases, stands in the way of a clean sweep being made of gas for lighting purposes. It comes back to the old question of money; and that is not the only consideration. Where such high prices as (say) 7s. 6d. per 1000 c.ft. obtain for gas to-day would only be in the smaller gas-supply areas—mostly residential, and the consumption of either gas or electricity for purely lighting purposes must average out per householder at a very small amount. The same would apply to electricity. Is Mr. Beauchamp sure of his ground? Gas at 7s. 6d. per 1000 c.ft. of 480 B.Th.U. quality would work out to 1s. 6·7d. per therm; and 1200 B.Th.U. will keep a 50-c.p. inverted light going for an hour easily. A therm would therefore keep the 50-c.p. light going for 83 hours. The 1s. 6d. (to take a round figure) would buy 1½ units of electricity; and as approximately 64 watts per hour are required for a 50-c.p. metallic filament lamp, this means that about 24 hours' use of the lamp would be given for the 1s. 6d. There will be no walk-over for electricity where cost is important, even with gas at 7s. 6d. Mr. Beauchamp himself declares that electricity undertakings "have obtained most of the [lighting] business available from the fairly well-to-do and the rich." What does this mean—that any extension of the lighting business will be among those less moneyed, and those perforce who have to be and are more economical in their use of light. They are less profitable consumers—in fact, some of them are positive losses to electricity concerns. Not long since there were many admissions as to this being so. What Mr. Beauchamp is advocating is intended to stimulate competition in places where gas and electricity concerns have a hard job to make a living in these times; and it can only result in mutual disaster. Still Mr. Beauchamp, as Director and Secretary of the Electrical Development Association, must advocate something.

Hire-Purchase Agreements.

The development of sales by hire-purchase facilities is the subject of an article by Mr. E. R. Morton in the "Electrician." His object is to boost-up this plan of doing business, and to give information concerning the method of setting about its inauguration. He finds that among electrical men there has been very little experience of the system; and therefore they are unable to visualize exactly what it means. In the first place, we know how other industries have developed the system with good results—such as furniture dealers, piano makers, sewing-machine and washing-machine firms, and so on. It is a system that is growing in popularity. The public understand it thoroughly; and what is more they like it, judging by the extent of its application and continuance. Therefore, so far as the public are concerned, the ground has been prepared for its acceptance in new directions. The manufacturers or dealers would not persist in it if it did not pay, and the public were unresponsive. Of course, the system requires capital; and care must be taken to protect the money invested. The author discusses two systems of hire-purchase. First, the one by which the hirer agrees to pay a settled sum at stated intervals, and signs an agreement which is stamped; and the second, under which the purchaser signs an agreement asking for the supply of a certain article, for which he pays a fixed sum down, and the balance by an agreed sum on a given date over a fixed number of months. In this case the appliance immediately becomes the property of the purchaser, and failure to complete the payments causes considerable difficulties for the seller. Mr. Morton apparently prefers the former course, though the lump sum down in the second plan is a temptation to favour it. He advises very careful consideration as to the amount to be charged to the consumer. But what he says in this connection might well have been extended to a presentation of the details. He merely indicates that the principal sum expended by the seller must be recovered as well as an additional sum, which must not be so high that it repulses the would-be purchaser, nor so low that it results in loss to the seller. But what would this additional sum comprise? That is what we should have liked the author to discuss. It must cover at all events interest until the last instalment of the principal is repaid. In some cases, too, the seller agrees to keep the appliance in working condition during the term of the purchase; some provision must, in such a case, be made in the charge for this. There is the question of installation, too. It is not altogether the same thing as buying an article which the seller delivers, and has merely to be set down in the place allotted to it by the purchaser. Installation of electrical appliances is a somewhat costly matter in these times. However, the author sums-up his article by saying that hire-purchase systems offer the electrical industry the prospects of an increased turnover otherwise unprocurable. All the arguments equally apply to the gas industry, and more so, because the appliances are less costly in first outlay for equal and greater duty; and they are less expensive to maintain.

Electric Cookers and Electric Failures.

The Great Northern Railway Company are indulging in an innovation. On a new restaurant car they are proposing to make a trial of electricity instead of gas for cooking purposes. It is clear from the published information that those responsible for this change are exercising a considerable amount of caution in their references to it. In one account we read that "so far" the experiment has proved highly successful. Naturally, being an innovation, the technical work has presented certain problems, and has ended in at any rate one unavoidable crude method to ensure to the extent possible continuous operation of the electric apparatus. The supply is to be drawn from the train's own dynamo, except when the train is standing at a station, when someone will have to arrange to connect-up the cooking installation to the supply serving the station—if the station has one. This appears to be a weakness of the scheme. One of the absurd statements made in connection with this trial is that it will be a great gain over gas in the matter of cleanliness, as all "dust and flue" are entirely eliminated. It would be extremely interesting to know where the "dust and flue" come from, in connection with the combustion of gas. Provision is also made for automatic disconnection in the event of accident. Among the admissions is one that in domestic cookery electricity is more costly than gas; but no figures are at present available in relation to cooking on dining-cars with the energy supplied from the train dynamo. It is quite obvious that the supply of either gas or electricity for train purposes has little similarity with the supply of either commodity in the home kitchen. Information concerning this change was given in the "Daily Telegraph" on Oct. 15. On the facing page, the two following paragraphs appeared: "The electric lighting on one of the District trains, with a full complement of passengers bound for the City, failed yesterday when approaching Earl's Court, and the guards had to light the emergency lamps, which are fitted with candles, and the train continued its journey with only this illumination." "Candles had to be used during the Fulham Council meeting on Wednesday night through the temporary failure of the electric light. The pressure was at one time so low that it was impossible either to read or write. The whole district was plunged into semi-darkness, and lighted candles illuminated the local places of amusement, and also the public-houses."

Fire Comparisons.

As we have said before, the electrical papers have been considerably agitated over the recent fire at the Magazin au Printemps in Paris, and have been doing all that they can to neutralize the bad effects of the destructive short-circuit which, it is alleged, was blamable. But what they have been saying has only reached the eyes of their technical and commercial readers, and not those of the general public, whom no doubt, from the point of view of electricity undertakings, it is more necessary should be satisfied that electricity is guiltless. They have been roving all about the world to get statistics regarding electrical fires in comparison with other causes of conflagration, and to the total number naturally they say the proportion of electrical fires is very small. It is not a question of proportion at all. The fires that happen, and are not electrically generated, are due to quite a considerable variety of causes; so that there is no quantitative relationship between the fires produced in one way, and those produced in many other ways. Another consideration that vitiates any such comparison is that electricity is used to a relatively small extent compared with the uses to which (say) gas is put. Whether in this country the basis of comparison is made on the number of consumers supplied, the variety of purposes to which gas or electricity is applied, or the number of connections in the way of lights, cookers, heaters of all descriptions, and engines or motors, the area of gas supply is (we might say) infinitely greater than that of electricity. Therefore, any bare comparison of figures, without regard to the basis, tells no authentic tale as to the relative danger or safety of the two commodities. Perhaps we might suggest that a better comparison would be found in the basis of the value of property destroyed by the two commodities. Doubtless our friends of the electrical industry will consider this point, because it does happen sometimes that such a little cause as a short-circuit will destroy buildings well stored with very valuable goods.

Debris of the Coal Strike.

There is no doubt the coal strike had a very deplorable effect on the finances of many electricity undertakings, just as it did upon those of gas-supply concerns. We have seen many instances of the strike having cost electrical undertakings several thousand pounds in extra expenses; and in the case of some municipal undertakings without reserves to help them over this ugly stile, the ratepayers will no doubt hear some more news which will not be altogether pleasing to them. Certain undertakings, we know, are considering the question of increasing the price of current to the consumers in order to produce sufficient to counterbalance the extra outlay incurred by reason of the strike; and, of course, this is with companies the only way in which they can recoup themselves for the additional expenditure. But in the case of many municipalities, the alternative of making the ratepayers "stump-up" will unquestionably be callously preferred to the only legitimate plan of making the consumers pay. The Birmingham Electricity Department appears to have been very badly hit by the strike, which caused it a loss of £43,100; and, of course, the subsequent and continued effect in loss of business and disorganization of working, it is quite impossible to assess. The estimated reduction in the sale of electricity during the three months is calculated at 6·8 million units, the gross selling value of which is computed at £59,000. Deducting the cost of producing this extra quantity, the loss is £32,400. The extra fuel and labour costs are estimated at £10,700—making

the total of £43,100. The Birmingham Electricity Department does not seem at all pleased over this condition of affairs.

Trade Union Tyranny.

On two or three occasions we have referred to the tyranny of the Electrical Trade Union in respect of their inhibition of the connecting-up of premises—in the one case where wiring was done by non-union labour, and in the other where cinema lights were going to be used by non-union operators. Another case of trade union tyranny (but not in this instance, so far as we understand, by the same trade union) comes from the town of Bray, in Ireland. The District Council have been confronted with one of the nastiest little dilemmas that it has ever fallen to the lot of a local authority to deal with in connection with trade union demand. The electricity undertaking contracts to pump water to the railway station. Recently a number of railwaymen struck work; and they required the District Council Electricity Department to stop its services in connection with the supply of the energy for pumping. The Electricity Department were given no option but to comply, or have all their own employees ordered out. This would have meant the complete stoppage of the electricity service to the district. In this instance, the cessation of the water pumping did not very much matter, in view of the fact that it related only to one consumer; but if this sort of thing is tolerated, one can easily see that it might spread into something much larger, more important, and still more disastrous. Supposing, for example, the Electricity Department supplied energy for the pumping of water to the whole of the inhabitants of the district. Suppose further the water-works employees came out, and the Electrical Trade Union threatened to support the water-works men by calling out the electricity employees, if there was not a discontinuance of the supply of energy to the pumping plant so that volunteer labour could not be employed—a local authority would be faced with a much more serious dilemma than that the Bray Council have had to encounter. It is obvious that there must be a stop put to these new trade union tactics, which are devised for the sole purpose of securing the objects of the few by bringing inconvenience and possibly suffering upon the many.

GAS ACTS FOR 1921.

[SECOND ARTICLE.]

PURSUING our survey of the Gas Acts passed in the current session of Parliament, we shall only in the main, as last week, point to variations from the notices given of the Bills at the time of their introduction. The Acts referred to this week were reviewed in Bill form in our issues for Jan. 12 and 19 last.

The first Act to be now examined is the general powers one of the MANCHESTER CORPORATION. In this it will be remembered the Corporation outlined a large scheme of gas-works construction on a new site at Partington, as well as the amalgamation with their own concern of that of the Stretford Gas Company. In connection with the gas-works' scheme, it will be recollected, the Corporation originally sought power to borrow no less than six millions sterling, repayable in forty years. This sum has been reduced for the time being to £1,640,000, with the period of repayment of forty years. For the Stretford amalgamation the sum sought was £300,000, repayable in forty years. The amount has been allowed; but repayment is to be made in thirty years. The Corporation have secured the right which they sought to purchase 161 acres of land for the new gas-works. To the clause authorizing the construction of the new works is appended the residual products one-third purchase clause. The clauses referring to the Stretford amalgamation are all included in the Act, together with the scheduled agreement with the Company, from which we gave some details when noticing the Bill on Jan. 12 last. The area of supply is extended so as to embrace the Company's territory. The standard calorific power of 450 B.Th.U. has been allowed; but the minimum pressure sought of 15-10ths has been altered to 2 in. The maximum price of gas stands at 5s. per 1000 c.ft. To the clause allowing this has been attached the proviso that, within one year from the passing of the Act, the Corporation are to apply to the Board of Trade for an Order under section 1 of the Gas Regulation Act, 1920, for authority to charge a maximum price per therm corresponding as nearly as may be to the maximum price authorized by this section, without any addition in respect of increases in the cost of the production and supply of gas which have occurred since June 30, 1914. After the reading of the meter indices at the end of December next, and until the completion of any sale (if any) of the Stretford Company's undertaking to a Joint Board, the price of the gas to be supplied by the Corporation to consumers, or for public lighting, in the Company's district, and in respect of so much of the urban district of Stretford as is now supplied by the Corporation, is not to be higher than the price charged by the Corporation for gas supplied in like quantities to consumers within the city, or, as the case may be, the price charged for gas supplied for public lighting therein, and the charges (if any) for the hire of meters, fittings, and cookers, are to be the same within the city and the districts named. In a succeeding paragraph it is provided that if the District Councils of Stretford, Urmston, Ashton-on-Mersey, and Sale, and the Rural District Councils of Barton-upon-Irwell and Bucklow, or any two or more of these Councils, jointly introduce a Bill in the next session of Parliament to provide for the constitution of a Joint Board, and require the Corporation to sell to the Board for the consideration mentioned, the whole of the undertaking as described in the scheduled agreement, and subject to the terms and conditions therein contained, the Corporation are not directly or indirectly to oppose the Bill, except in so far as may be necessary, in order to secure the insertion therein of provisions to protect their interests. The consideration for the sale and purchase under this provision include the payment to the Corporation of all sums paid or payable by them to the Company, or their officials or employees, under the scheduled agreement. The Board would also take over and assume full liability for the repayment of the Company's debenture stock, and discharge all debts and obligations for the payment and discharge of which the Corporation are liable under the agreement. Further the Board would repay to the Corporation all sums expended by them in additions to, or improvements of, the Company's undertaking. There are other clauses dealing with financial and subsidiary matters. Among them is one which provides that, if "Harry Kendrick, Joseph Hall, David Thomas Livesey, Ernest Nicholson, Thomas Emmett, and Robert Henry Moss, who were respectively at the passing of this Act in the employment of the Company, shall, at the date of the completion of the sale of the said undertaking to the Board, be in the employment of the Corporation pursuant to the scheduled agreement, he shall be entitled: (*a*) To decline to enter the service of the Board; (*b*) (having entered such service) to resign therefrom within twelve months from such entry; and (*c*) in either of those events (without prejudice to his rights under paragraph 17 of the scheduled agreement) to receive compensation under that paragraph as if he had been dismissed by the Board within twelve months after the transfer of the said undertaking to the Board." There are numerous clauses for the protection of various authorities, covering no less than twenty-five pages of the Act. An interesting feature of the Act is the provision that is made for the application of the gas revenue. It is to be devoted to the expenses incurred in the working and maintenance, renewal, and repair of the undertaking; in payment of interest on moneys borrowed; in providing requisite appropriations for sinking fund payments; in repaying to the city fund any deficiency in the revenue; in promoting a fund for working capital not exceeding £400,000, the amount set aside annually for which is not to exceed £40,000. Provision is also made for a reserve fund. What follows is the important part of the provision: "The residue (if any) of any such moneys shall be carried forward to the revenue account of such undertaking for the next succeeding year, and shall, whenever and so soon as the amount so carried over exceeds the sums required to meet the purposes secondly and thirdly above-mentioned for one year, be applied to the reduction of the price of gas supplied by the Corporation." [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The RADCLIFFE AND LITTLE LEVER JOINT GAS BOARD has been constituted by the Act passed this year. The Board, as was seen when the Bill was originally under notice, are taking over the Radcliffe and Pilkington Gas Company's undertaking. The new Board will consist of six members, to be appointed by the Radcliffe Council, and one member by the Little Lever Council. The first elections are to take place within two months after the passing of the Act, or within such further time as the Ministry of Health shall allow; and these members are to continue in office for not less than a period of one year, and not beyond April 30, 1924. When noticing the Bill on Jan. 12 last, we gave a large amount of information regarding the capital of the Company and the terms of the agreement for the sale of the undertaking; and, so far as can be seen, there is nothing to add to, or to withdraw from, what was then said as to the terms. The Act contains clauses for the maintenance, improvement, and renewal of works upon the scheduled lands. To this clause is attached the now usual residuals provision, including the one-third purchase restriction. A clause appears providing for a calorific power standard of 500 B.Th.U.; but the Board have secured the provision as to 15-10ths pressure, with the exception that all gas supplied by them to the Lancashire and Yorkshire Railway Company is to be at a pressure of not less than 2 in. Provision is made for a revision of the calorific power and pressure clauses if within one month after the expiration of five years from the passing of the Act, or any subsequent period of five years, the Board, or any local authority or person having a substantial interest in the matter, apply for revision to be made. The maximum price allowed is 7s. 6d. per 1000 c.ft.; but it is provided that, within twelve months from the passing of the Act, the Board shall apply to the Board of Trade for an Order under section 1 of the Gas Regulation Act. By the Order, the Board of Trade may authorize the Joint Board to charge a maximum price per therm corresponding as nearly as may be to the maximum price now authorized, without any addition in respect of increases in the cost of the production and supply of gas which have occurred since June 30, 1914. A charge for the hire of prepayment meters and fittings is allowed at the rate of 1s. 3d. per 1000 c.ft., or 1s. 6d. if a cooker is included. For a meter without fittings 10 p.ct. on the cost is the maximum payment. The proposal of the Board regarding powers as to the making of bye-laws for the purpose of enabling them to regulate the piping and fittings used upon a consumer's premises has been altered to the ordinary form of clause which bears the side head-

ing "As to Construction and Placing of Pipes, &c., between Mains and Meters." In respect of the clause referring to a minimum charge for gas to premises having a supply of electricity or power gas, a minimum sum is fixed at not exceeding 25s. for any one quarter of a year, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a lower sum. There is a proviso to this that, in respect of any premises for which the whole supply of gas afforded by the Board is taken through a meter having a nominal capacity of not more than ten lights, the amount of the minimum shall not exceed 5s. for any quarter of a year. Respecting borrowing powers, the necessary money required for the purchase of the undertaking is allowed, as well as the £5000 sought for the alteration and improvement of the works, and the £10,000 required for new mains and works extensions. The original proposal for working capital was £40,000; but this has been reduced to £20,000. The periods for repayment have been altered somewhat. In respect of the purchase money thirty-five years is the time allowed. For the money borrowed for the alteration and improvement of the works, as well as for gas-main purposes, thirty years are sanctioned. For working capital, ten years is given from the dates of borrowing. As to surplus profits, it is provided that these shall be from time to time, when circumstances permit, applied either in reducing the price of gas throughout the limits of supply, or by way of division among the constituent authorities in proportion to the receipts of the Board from consumers (whether public or private) for gas supplied within the districts of those authorities respectively. The power to establish an accident fund to the amount of £10,000 is allowed; but we do not see the one regarding the fire insurance fund as was contemplated in the Bill. [*Parliamentary Agents: Messrs. Lewin, Gregory, & Anderson.*]

The RHYMNEY AND ABER VALLEYS GAS AND WATER ACT is, so far as the supply of gas is concerned, chiefly a money measure. In reviewing the Bill, on Jan. 12, we gave information as to the financial position of the Company. The borrowing powers sought by the Bill have been reduced; and they now stand as follows: The Company may borrow any sums not exceeding in the whole (in addition to any sum already borrowed under the powers conferred under the Act of 1898 in respect of the ordinary and preference shares created under that Act and the Acts of 1905 and 1908) the sum of £47,087; any sums not exceeding in the whole (in respect of the additional capital authorized by the Act of 1914) the sum of £9585; and from time to time any sums not exceeding in the whole one-half part of the amount of any capital for the time being raised after the passing of this Act under the powers of the 1914 Act as amended by this measure. Debenture and redeemable preference and debenture clauses succeed. The limitation of dividend in the Act of 1914 is removed in relation to any preference capital hereafter created; and the Company may now issue it at such rate as may be determined at the time or times of the creation of the new capital. Provision is made for the appointment of a managing director. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

In their General Powers Bill, the ROTHERHAM CORPORATION asked to be allowed to amend the maximum price of gas by putting it at 5s. per 1000 c.ft. This clause has been deleted, and so does not now appear in the Act. Probably this means that the Corporation will obtain the necessary change through an Order under section 1 of the Gas Regulation Act, 1920. The Act, however, confers power to vary the price of gas according to the purposes for which it is supplied, providing that the Corporation do not give any preferential price as between consumers who are taking a corresponding supply of gas for the same purpose in similar circumstances. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Act of the SOUTH METROPOLITAN GAS COMPANY is to all intents and purposes supplementary to the important one which they obtained in 1920. The provisions and objects of this measure were explained in a statement given in our issue for Dec. 29, 1920 [p. 762]. Dealing first with the financial provisions, it may be briefly stated that certain borrowing powers in the Acts of 1916 and 1918 have been repealed; and then power is taken to issue further capital to an amount not exceeding in the whole £500,000 by the creation and issue of further ordinary or preference stock. Authority is conferred to reissue redeemable debenture stock; and the directors are also empowered to fix the rate of interest upon any preference capital which may be hereafter issued. Sanction is given to the Company to create as redeemable preference stock any portion of the capital they are authorized to raise as preference capital under the Act of 1918 or the present one. The same applies to the authorized debenture stock. Clause 16 is one on which the President of the Company (Dr. Carpenter) has more than once laid great stress. It reads: "All directors of the Company elected after the passing of this Act shall be persons possessing professional, technical, commercial, financial, or scientific knowledge advantageous to the conduct of gas undertakings. The Chairman of the Board of Directors shall be designated the President of the Company, and the Deputy-Chairman of that Board the Vice-President of the Company; and they shall both be persons having substantial practical or business experience in the production and sale of gas." Succeeding this clause is one empowering the appointment of a managing director or managing directors; but the managing director is not, so long as he receives remuneration as a managing director, to be deemed a director for the purposes of directors' remuneration. With reference to the auditors, the prescribed number to be elected is two; but it may be increased to three by a resolution of the directors. The power is also given to the directors to determine the remuneration of the auditors from time to time. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

"SENSIBLE HEAT" LOW-TEMPERATURE DISTILLATION IN ROTARY RETORTS.

For Town's Gas Purposes, or for the Production of Smokeless Solid Fuel, and Gas for Electricity Generation.

THERE has been introduced to our notice a new plant and process for the distillation of coal by the direct heating at low-temperature of the charge inside a rotary retort. The inventor is Mr. Harald Nielsen, a Danish engineer resident in London. An experimental plant has been erected at Chatterley; and several engineers and gas chemists who have seen it at work and have examined the results, speak very favourably of it. The plant has a flexible range of application; but naturally our readers will be chiefly concerned in it from the point of view of its application to the production of a gas suitable for town purposes by employing water gas as the medium for the internal heating of the retort charge, and giving off some 36,000 c.ft. of gas of 380 B.Th.U., or 136·8 therms, with another 70,000 c.ft. of 110 B.Th.U. for the production of electricity, which is enrolled among the "bye-products." For the following account of the process (which has been slightly revised by us) with the figures as to results and costs, we are indebted to Mr. Nielsen. He takes sole responsibility for the figures and calculation, and is prepared to demonstrate their veracity. Among other things, it will be noticed that he takes the cost of coal in the town gas figures at £1 per ton; but lower down he has worked-out the cost at per 1000 c.ft. of 380 B.Th.U. gas at various prices per ton of coal. With this preface, the information supplied by Mr. Nielsen is as follows:

GENERAL.

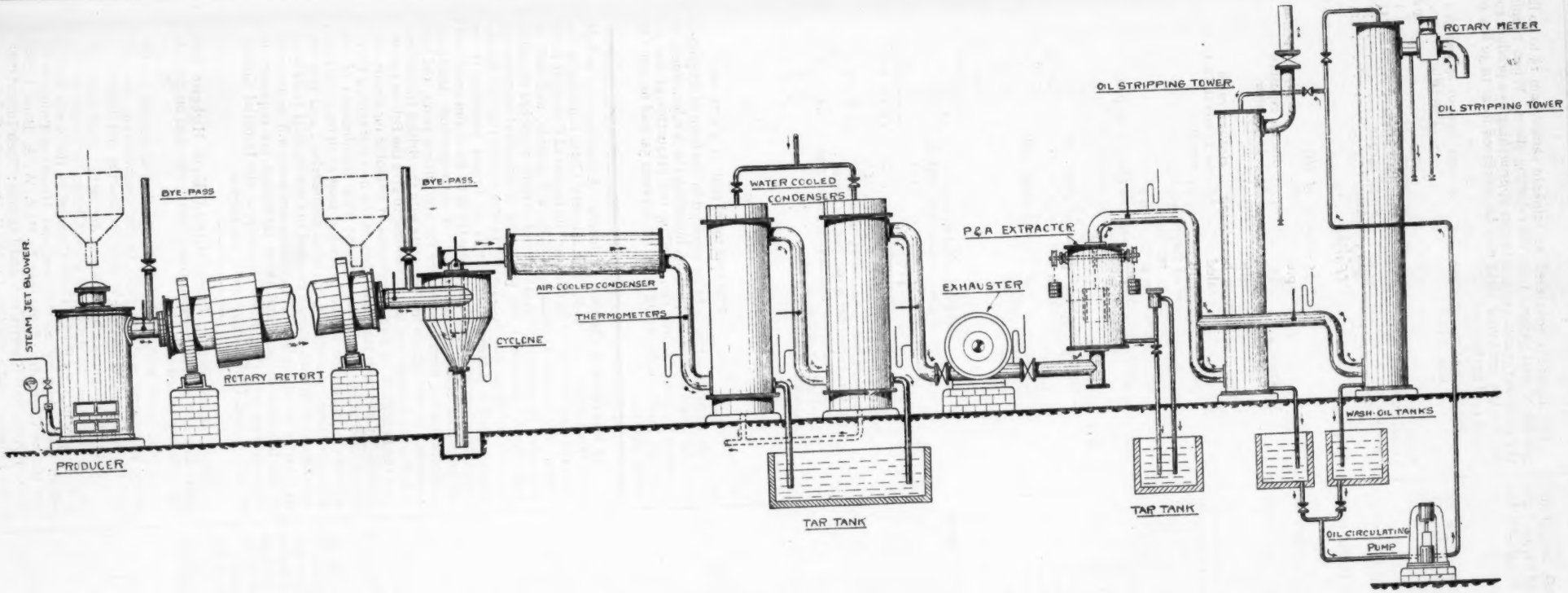
Hitherto it has been the general practice to heat carbonizing retorts by the application of external heat obtained by the ignition of producer gas in the flues surrounding the retort, or alternatively by the combustion of the whole or part of the gases evolved by the process of carbonization. In modern times, the thermal efficiency of these externally heated retorts has, by means of preheating and recuperative arrangements, been brought up as high as is practically possible; and the actually consumed fuel has been brought down to between 10 and 15 p.ct. by weight of the raw coal carbonized. Recent research work indicates that, in order to carbonize a given quantity of bituminous raw coal, with a moisture content of about 3 to 4 p.ct., 2·5 to 2·75 p.ct. only of the total heat value of the coal is required—the difference, 7·5 to 13 p.ct. being lost.

It will be obvious from this that, in order to retrieve this loss, radical alterations in the present methods employed must be carried out; and the ways and means which naturally suggest themselves are: (1) Internal heating of the retort; (2) continuous treatment of the material in bulk. Particularly from the point of view of low-temperature carbonizing, the method of employing internal heating is of the greatest importance all round. It is well known that, in order to overcome the poor heat conductivity of coal, this must be subjected to heat treatment in thin layers, in order to effect the carbonizing within reasonable time-limits. Further, the temperature difference between the temperature prevailing in the heating flues and that inside the retort at which the actual carbonizing takes place, is very great. The heating flue temperature is from 1000° to 1200° C., while the carbonizing temperature for low-temperature distillation is generally from 500° to 600° C. It will be clear that the difference, 500° to 600° C., represents a loss which should be avoided; and it is possible to do so by utilizing the sensible heat carried by an inert gas—that is to say, a gas not containing any free oxygen. An inert gas, which particularly lends itself to the purpose is producer gas, or water gas.

It is well known by the reactions taking place in a gas-producer between free oxygen and carbon, that a large amount of heat is liberated. This heat serves to raise the temperature of the evolved gases up to a height depending naturally upon the way in which the producer is worked. For instance, in ordinary producer-gas practice, the temperature of the outgoing gases from:

Hot gas producers is from 850° to 950° C.
Semi-cold gas producers is from 650° to 850° C.
Cold gas producers (bye-product producers) 550° to 650° C.

This so-called sensible heat is given off by the gases as they are cooled-down; the gas retaining its actual heat value or latent heat. The sensible heat contained in hot producer gas when leaving the producer amounts to a very considerable percentage



of the heating value of the coal gasified, and ranges between 13 p.ct. up to about 17 p.ct. of this.

Assuming the gas leaves the producer at 800° C., and taking the specific heat 0·3, one cubic metre when cooled down to 0° C. liberates 240 kg. calories. This corresponds to $240 \times 4 \times \frac{1000}{35} =$ 27,400 B.Th.U. per 1000 c.ft., or 27·4 B.Th.U. per c.ft. This heating value cannot be utilized to its fullest extent, as the gas should leave the retort at a temperature of about 120° C. in order to avoid any condensation of the tar vapours; so that only 23·3 B.Th.U. per c.ft. are available.

In the cement and ore-roasting industries, very many years' practical experience has shown that the most economical and convenient method of dealing with material in bulk for calcining or roasting is to employ an inclined rotary kiln through which the material passes by gravitation in countercurrent to the heating medium (the combustion gases). A number of convincing tests carried out during the last three years indicate that this method is the most economical to follow in carbonizing practice, particularly for low-temperature bulk distillation of carbonaceous materials.

The amount of heat required for carbonizing in a rotary retort a bituminous slack containing about 3 p.ct. of moisture, including radiation and convection losses per ton, is approximately 200,000 kg. cal., equivalent to 800,000 B.Th.U. The volume of gas at 800° C. required to carry the sensible heat necessary, reckoned at 0° C. is $\frac{800,000}{23·3} = 34,300$ c.ft. The amount of bituminous slack to be gasified in a modern producer to produce this volume of gas at a suitable temperature is $\frac{34,300 \text{ c.ft.}}{125,000 \text{ c.ft. per ton}} = 0·275$ ton of coal, say 0·3 ton. As the sensible heat carried away by the 34,300 c.ft. of gas represents approximately 14·5 p.ct. on the heating value of the coal gasified, we have the actual heat required to distil a ton of raw bituminous slack under low-temperature conditions equal to 0·275 ton $\times \frac{14·5}{100} = 0·04$ ton = 4 p.ct. Allowing for the steam requirement of the gas-producer, and its thermal efficiency, &c., this figure is brought up to 6 to 7 p.ct. on the heat value of the coal distilled, which is about half of the present externally fired retort practice.

The Rotary Retort Process.

The diagram indicates a plant for the production of a solid smokeless fuel for industrial and domestic purposes, with the recovery of bye-products in the form of tar oils, sulphate, and low calorific power gas. But by the production of water gas instead of producer gas as the heating medium, gas of a calorific value of about 400 B.Th.U. is produced. To this reference will be made presently.

The coal to be treated is elevated to a coal-bunker, and thence is continuously fed into the rotary retort, meeting a stream of hot producer gas (or water gas, as the case may be) generated in the adjacent producer which is self-feeding and self-clinkering. The carbonaceous residuum is collected in a coke chamber forming an integral part of the retort itself, and its cooling takes place in an inert atmosphere. The producer gas, enriched by the gases and tar oil vapours given off by the coal, enters a dust-separating cyclone, and afterwards passes through a series of condensers, tar-extractors, and oil-washers. In these various appliances, the gas is stripped of condensable matter, and the ammonia is recovered by the direct method.

Of course, the plant can be varied at will, according to the purpose for which it is required. Plant for combined low-temperature distillation and complete gasification for the production of a high calorific gas, fuel oil, and power gas is similarly arranged to the diagram. As far as the low-temperature distillation and the subsequent treatment of the gas for bye-products is concerned, water-gas producers are substituted for the single ordinary producer; and all the semi-coke, after being subjected to an agglo-

meration process, is gasified in these. The sensible heat of the water gas generated is increased to the desired extent by the combustion of a part of the low-calorific blow gas, and is utilized for the distillation of the coal in the usual way.

TOWN GAS SUPPLY.

We will give first Mr. Nielsen's figures, as derived from his experimental work, for town gas supply, obtained by complete gasification by the "Sensible Heat" process.

Production and Efficiency.

Bituminous coal of about 11,400 B.Th.U. per lb. = 25,536,000 B.Th.U. per ton.

High calorific gas produced: 36,000 c.ft. at 380 B.Th.U. per cubic foot.

Corresponding to 13,680,000 B.Th.U.

Or equal to 53·5 p.ct. of the total heat value of coal in the form of high calorific gas.

Low calorific gas produced: 70,000 c.ft. at 110 B.Th.U. per cubic foot.

Corresponding to 7,700,000 B.Th.U.

From these figures it will be seen that the total thermal efficiency of conversion, allowing for the heat needed for carbonizing steam for the water-gas producer, is 80 p.ct.

Costs.

Cost of treating 1 ton of coal, maintenance, and repairs to plant, including depreciation, &c.	2s. 0d.
Labour	1 6
Cleaning of gas, *plus* sundries and water	1 0
Power	0 6
Total	5s. 0d.
Cost of 1 ton of coal	£1 0 0
Total costs	£1 5 0

Products per Ton of Coal.

1. 70,000 c.ft. at 110 B.Th.U., equal to the production of (30,000 B.Th.U. = 1 KW.-hour.)	256 KW.-hours.

Cost of generating 1 KW.-hour.

Maintenance and repairs to plant—	
Plus depreciation	0·10d.
Labour	0·12
Lubricants, &c.	0·03
Total	0·25d.
Sale price per 1 KW.-hour	1·00d.
Cost of generating	0·25
Net profit, per KW.-hour	0·75d.
256 KW.-hours at 0·75d.	16s. 0d.
2. Fuel oil 12 gallons at 3d. (6 to 8 gallons of pitch are produced as well; but this is utilized for consolidating the breeze.)	3 0
3. Sulphate produced equal to value per ton of coal	1 6
Total net value of bye-products	£1 0 6
4. Gas produced: 36,000 c.ft. at 1·5d. per 1000 c.ft.	4 6
	£1 5 0

Cost of Raw Coals or Bituminous Slack per Ton.	Cost of 380 B.Th.U. Gas per 1000 c.ft.
£1 0 0	1·50d.
1 5 0	3·16
1 8 0	4·16
1 10 0	4·84
1 15 0	6·50
2 0 0	8·20
2 5 0	9·84

PRODUCTION OF SOLID SMOKELESS FUEL WITH BYE-PRODUCT RECOVERY.

Distilling bituminous slack of about 11,400 B.Th.U. per lb. = 25,536,000 B.Th.U. per ton containing 30 to 32 p.ct. volatiles in a rotary retort by means of the sensible heat of producer gas from 0·70 to 0·75 ton of solid semi-coke is obtained. The mixed gas obtained from the producer fuel *plus* the rich gases evolved from the coal in the retort amounts to 44,000 c.ft. at 233 B.Th.U. per c.ft. (amount of producer fuel = 0·313 of coal carbonized).

After providing for the steam and power requirements of the plant, 330 KW.-hours are produced by the excess gas.

Tar oils produced, 20 gallons per ton of coal of the following composition:

	P.Ct.
Light oils up to 180° C.	4·75
Medium oils from 180° to 230° C.	20·00
Heavy medium oils from 230° to 270° C.	14·50
Heavy oils from 270° to 320° C.	24·00
Pitch	35·00
Loss	1·75
	100·00

Average percentage of cresols, 20 p.ct.
Free carbon in pitch from 0 up to 4·5 p.ct.

The ammonia recovered as sulphate varies from 15 to 20 lbs. per ton of coal gasified from the retorting alone. When running the producer under circumstances approaching bye-product conditions, the ammonia yield may be increased to 28 to 30 lbs. per ton of coal carbonized.

Average Analysis of Raw Coal (A).

	P.Ct.
Moisture	2·8
Volatile matters	31·1
Fixed carbon	53·7
Ash	12·4
Total	100·0

Average Analysis of Smokeless Fuel (B).

	P.Ct.
Moisture	1·9
Volatile matters	11·5
Fixed carbon	70·7
Ash	15·9
Total	100·0

Ultimate Analysis of (B).

	P.Ct.	
Moisture	1·9	due to exposure to weather.
C	71·2	Heating value = 11,000 B.Th.U. per lb.
H_2	2·9	
O_2	4·9	
N_2	1·5	
S	1·7	
Ash	15·9	
Total	100·0	

The over-all thermal efficiency of the plant is 92 p.ct.

Expenses per Ton of Coal Carbonized.

Working Expenses—	
A—Maintenance and repairs to plant, including depreciation	2s. 0d.
Labour	1 6
Cleaning of gas, *plus* sundries and water supply	0 9
Power	0 6
	4s. 9d.
B—1 ton of coal carbonized at 20s.	£1 0 0
0·313 ton of coal as producer fuel at 20s.	6 4
Total costs	£1 11 1
Products Obtained per Ton of Coal Carbonized—	
Smokeless fuel, 0·70 to 0·75 ton at 20s.	£0 15 0
330 KW.-hours, net profit per KW.-hour = 0·75d. (sale price 1d. per unit) 330 x 0·75d.	1 0 7·5
Fuel oil, 20 gallons at 3d.	5 0
Sulphate of ammonia	1 6
	£2 2 1·5
Deduct total costs	1 11 1
Profit per ton of coal	£0 11 0·5

If the smokeless fuel is to be supplied in the form of briquettes, the additional cost of briquetting, including the binder, would be between 5s. and 6s. per ton. Selling the briquettes at 20s. per ton, the profit made would then be between 5s. and 6s. per ton of briquettes.

An Institution of Chemical Engineers.—A meeting is to be held next Wednesday, Nov. 9, at the Engineers' Club, London, to discuss the best method of forming an Institution of Chemical Engineers. Sir Arthur Duckham, K.C.B., will preside, and will be supported by many representatives of various branches of industrial activity allied with the profession of chemical engineering. It is felt by those who are moving in this matter that the formation of such a professional body is an urgent necessity if the manufacturing prestige of the country is to be maintained, and its industrial efficiency increased. A corresponding American organization has been in existence for over fifteen years, and has expressed its willingness to co-operate with the British Institution, if and when formed, and is quite willing to give the British Institution the benefit of its own experiences in attaining maximum efficiency. It has been suggested that, in the first instance, a provisional institution should be formed; that membership of this provisional institution should be open at once to all chemical engineers, or those interested in chemical engineering; and that this provisional institution should proceed to form the final Institution by Charter or otherwise. The meeting next week will be preceded by an informal dinner; and those interested are requested to communicate with Prof. J. W. Hinchley, at the Imperial College of Science and Technology, South Kensington.

Mr. Thomas Stephen Lacey, M.Inst.C.E., of Highgate, formerly Engineer of the Beckton Gas-Works, who died on Sept. 2, left property valued at £4923.

A pipe-line is being laid from the pocket of natural gas recently discovered at Vaux (Ain) to the neighbouring town of Ambérieu, where the gas will be used for heating and lighting.

Among the papers to be presented during the 168th session of the Royal Society of Arts, and after Christmas, is one by Mr. E. V. Evans, O.B.E., F.I.C., Chief Chemist to the South Metropolitan Gas Company, on "Solved and Unsolved Problems in Gas-Works Chemistry;" another by Prof. W. A. Bone, D.Sc., Ph.D., F.R.S., on "Brown Coals and Lignites: Their Importance to the Empire," and a third by Dr. W. R. Ormandy, F.C.S.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Preston.

THE 190th Quarterly Meeting of the Manchester District Institution of Gas Engineers, of which Mr. SAMUEL TAGG is President, was held at Preston last Friday. The members, to the number of 120, were hospitably entertained by the local Gas Company. A visit was paid to the Moor-Lane Gas-Works.

THE GAS-WORKS.

The works of the Preston Gas Company, as designed by the late Mr. Green, consisted of three separate stations; but in 1910 the smallest station was closed-down, and the other two, divided only by a street, were slightly remodelled to enable them to be operated as a single works. On the Moor Lane side a bench of fourteen settings of six retorts was installed in 1910, with complete coal and coke handling plant, and both the Fiddes-Aldridge and De Brouwer charging machines. In the same house are two sets of Humphreys and Glasgow's carburetted water-gas plant, each of ¾ million c.ft. per day capacity. The whole of the condensing, washing, scrubbing, and purifying plant, with exhausters and meters, is situated on this works, together with the laboratory, joiners' shop, and ammonia concentrating plant.

On the adjoining North Street works, an installation of four settings of Glover-West vertical retorts was erected in 1914, and an additional four beds are in course of erection; the coal and coke handling plant being designed to serve the complete installation. A disused retort-house has been converted into a large workshop on the ground floor, with general stores on the first floor. The former comprises a well-equipped engineers' repair shop, meter cleaning and repair shop, and accommodation for fifty gas-fitters and plumbers. The main boilers, carburetted water-gas blowers, and oil-storage tanks, with two small gasholders, are also situated on these works. The main gasholder storage station is some two miles away; and the bulk of the gas is conveyed by an independent main, which also serves two other distributing stations.

Preston was one of the first provincial towns to undertake the supply of gas—the Company being established in 1815; and the site of the present works was chosen many years before the introduction of railways into the town. As a result, they suffer from lack of railway communication; and their adaptation to modern needs has presented many difficulties, due to the limited area and varying levels, and also to the fact that the capital expended by the Company was unusually high.

A rapid development of business during the last ten years, due principally to the introduction of prepayment meters (16,000 having been fixed since 1912), has enabled a reduction in the capital expended from £1000 to £650 per million c.ft. Owing to the war, necessary extensions of condensing, scrubbing, and purifying plant have been deferred. These are now in hand, and it is anticipated that within the next year they will be proportioned to the generating plant, and will serve for a maximum production of 4½ million c.ft. per day.

The central offices of the Company, which were also visited, erected in 1878 in the main street, are one of the architectural features of the town. The front portion of the office was converted into a showroom in 1910, and resulted in an immediate increase in the sales of appliances which have been well maintained; the value for the past year exceeding £10,000. Last year a large showroom behind the main office was remodelled, in order to display to the best advantage all types of gas appliances fixed under the best possible conditions; and this has been of great service to architects, builders, and householders.

LUNCHEON.

The company were entertained at lunch by the Directors of the Company, at the Bull and Royal Hotel. Mr. JOHN LEIGH (the Chairman of Directors) presided, and was supported by the Mayor (Alderman Parkinson), Mr. Tagg, and others. A brief toast list was gone through.

The MAYOR submitted "The Manchester District Institution of Gas Engineers." He pointed out that in Preston the gas undertaking was not publicly owned, but was in the hands of the Preston Gas Company; but as Mayor he had no hesitation in saying he thought the inhabitants of the town were very well served by the Company. ["Hear, hear."] He thought that during the recent coal strike the Company did their best to keep the public supplied. He knew that gas undertakings, whether carried on by a company or not, rendered a great public service during the war; and he was afraid it was done in many instances at the expense of the owners and shareholders.

Mr. TAGG, in reply, referring to the Mayor's remarks as to the war service of gas undertakings, said they were not profit-earning concerns, but primarily rendered a public service which was carried on with a margin of profit representing the necessary interest on the capital employed in the business. They all knew that in times of peace, as well as of war, the industry rendered an important service to the community; and there were few trades and businesses to which their commodities could not be supplied with advantage. It was certain that in the domestic sphere a gas supply was absolutely essential. Gas undertakings were faced with many difficulties; and an Institution such as theirs—representing the virile counties of Lancashire and Yorkshire—could assist materially in the solution of their problems.

Mr. E. H. HUDSON (Normanton) proposed "The Preston Gas Company," and the health of the Directors. He said the gas undertakings of the country had had a hard struggle during the past seven or eight years. They had gone through many vicissitudes, which could hardly have passed over the local Company. But this had tested their soundness; and he believed they were more appreciated by the public than ever before. This being so, they were not without their reward. The struggle had acted as a stimulus to those in charge of the industry; and they had had to do things which were not strictly orthodox, but which had given them important knowledge. Now that they had turned the corner, they looked for more prosperous times; and he did not think in the future they would regret their war-time experience. While other industries fell into the way of spending money, they got into the way of saving it, with the result that they were in the sounder position, and could show real progress.

Mr. C. EASTWOOD replied, and said the war-time service of the Company had required a big effort; but he thought that it had enormously strengthened their position.

THE BUSINESS MEETING.

The meeting followed—Mr. TAGG presiding. A number of letters of apology for absence were read.

NEW OFFICERS.

The following officers were appointed:

President.—Mr. Harold Davies (Chesterfield).

Vice-Presidents.—Messrs. R. E. Gibson (Liverpool) and G. S. Frith (Runcorn).

Hon. Treasurer.—Mr. T. Banbury Ball (Rochdale).

Hon. Secretary.—Mr. W. Rogerson (Middleton).

Committee.—Messrs. R. H. Ginman (Leek), W. B. M'Lusky (Halifax), and H. R. S. Williams (Altrincham).

Auditors.—Messrs. W. Hill (Stalybridge) and F. Elliott (Leyland).

The PRESIDENT pointed out that, owing to Mr. Frith having taken over the management of the adjoining works at Frodsham, and having greater demands upon his time in running two works and making the necessary alterations, he was unable to continue his duties as Secretary; but he had allowed his name to go forward as Junior Vice-President. The opportunity would occur at the annual meeting to further refer to his services. To fill the post they had a capable and energetic gentleman, who would no doubt be stimulated by the example of his predecessor.

Mr. FRANK H. ROBINSON, of Harrogate, then read a paper on "The Gasification of Coal in Relation to the Sale of Gas on the Thermal Basis." This, with a report of the subsequent discussion, will be found below.

THE GASIFICATION OF COAL IN RELATION TO THE SALE OF GAS ON THE THERMAL BASIS.

By FRANK H. ROBINSON, Assoc.M.Inst.C.E., of Harrogate.

[A Paper read before the Manchester District Institution of Gas Engineers, on Friday last.]

The question of the best method of obtaining from our coal the greatest economic yield is one that is very important to-day. Recent legislation, the disastrous strikes during the last few years, the high price of coal, and the necessity of conserving our coal supplies, make this question one for earnest and immediate consideration. With this end in view, the Council of this Institution decided to raise a discussion on the subject of "The Gasification of Coal, &c.;" and, in view of my experiments on complete gasification, it was arranged that I should open the discussion on the side of maximum gasification. Let me say, first of all, that some of the points put forward by me are purely for the purpose of discussion, and not necessarily my strong opinions; also, that I have purposely refrained from dealing with the features of any particular plant. The subject before us is one of policy. This subject is a very large one; and I have found, when writing these notes, that it is quite impossible adequately to cover the ground in the time available, as there are so many different conditions to be met. I have therefore treated it in a broad sense.

The problem is that one ton of coal contains about 30 million B.Th.U., and that it is necessary to preserve for public use the greatest possible number of these units. Shall the problem be solved in terms of gas, tar, and coke, or in gas alone? Also, shall we consider finance or heat conservation to be the more important

issue? In ordinary gas-works practice, without water gas we can obtain with good working about 80 p.ct. thermal efficiency in gas, coke, and tar, or 24 million B.Th.U. per ton of coal, thus:

Example 1.

	B.Th.U.
Gas	6,500,000
Coke for sale	15,500,000
Tar	2,000,000
	24,000,000

Dilution, not Degradation.

To keep inerts down to a reasonable limit, these figures would mean making about 12,500 c.ft. of 520 B.Th.U. gas per ton. Better results than the above can be obtained without steaming, I am aware. But there are also worse results; and I take the 6·5 million B.Th.U. per ton as very fair working. Works having nothing but horizontal retorts will not be able to get down below 520 B.Th.U. gas without excess of air or furnace gases with their attendant evils. We are, with a few exceptions, generally agreed that the most suitable gas of to-day is from 450 to 500 B.Th.U. How, then, must such works give satisfactory service by keeping inerts and specific gravity down to a reasonable figure? The only method is by dilution, not degradation; and the most suitable diluent is blue water gas introduced at the foul main in the retort-house. Lightly carburetted water gas is also very suitable; but there comes in here the question of the cost of oil. Blue water gas can be produced in the following ways:

(1) Steaming retorts.
(2) Separate water-gas plant.
(3) Complete gasification in one stage.

Steaming vertical retorts is being practised at very many works with excellent results with some types of retorts; but there are other types where satisfactory results with regard to gas can only be obtained by sacrificing the total output of gas from the plant and at the same time reducing the total yield of British thermal units.

With separate water-gas plants most of you are intimately acquainted. These may be for blue or carburetted water gas, in which coke and oil are the fuels, or they may be of the Perry, Tully, and "K. & A." types, in which the fuels are coal, coke, and tar.

Value of Water-Gas Plant.

Up to the last few years, water-gas plants have been looked upon chiefly as enriching and "stand-by" plants, to be brought into operation to meet emergencies. The result was that the composition and density of the gas supplied in many towns was constantly varying, although the illuminating power may have been kept fairly constant. This was not a serious matter with flat-flame burners; but with the more extended use of incandescent burners and heating appliances, complaints came in larger numbers when such variations occurred. Conditions have now changed; and if we are to obtain full advantage of the Gas Regulation Act, a definite percentage of water gas will have to be supplied all round. The recent reports of the Special Committees on carbon monoxide and inerts have left the ground clear; and it is our duty to make the most of the opportunity given to us for efficient service.

We have found from experience, especially during the coal strike, that gas containing water gas gives excellent results in both lighting and heating, due to the high flame temperature obtained by the combustion of carbon monoxide. I have myself obtained an excellent light in an incandescent burner from mixed gas containing 27·7 p.ct. of CO at only 1-in. pressure; the calorific value of the gas being 394 B.Th.U. gross. The appearance and the efficiency of a modern gas-fire are both improved with an increased percentage of water gas.

Let us assume that we wish to supply 460 B.Th.U. gas, and have horizontal retorts and blue water-gas plant. The proportions of straight coal gas and water gas would require to be—

	B.Th.U.
Coal gas, 2 parts at 550	= 1100
Blue water gas, 1 part at 280	= 280
	3)1380
Mixed gas	460

We should then be making about 11,811 c.ft. of 550 B.Th.U. gas per ton in the retorts.

The heat balance from one ton of coal would then be—

Example 2.

	B.Th.U.
Coal gas, 11,811 c.ft. × 550	= 6,500,000
Blue water gas, 5905 c.ft. × 280	= 1,653,400
Heat units in gas	8,153,400
Coke for sale, 8¼ cwt. (10 − 1¾)	12,337,920
Tar	2,000,000
Total heat units	22,491,320

This represents a heat efficiency of 75 p.ct., being less by 5 p.ct. than if no water gas is made. The use of a waste-heat boiler on the water-gas plant will, of course, increase this efficiency.

The make of mixed gas would be 17,725 c.ft. per ton.

By complete gasification in one stage, 19 million B.Th.U. per ton and no coke can be obtained when making 370 B.Th.U. gas. Taking the mixed gas produced at 370 B.Th.U., and working such a plant along with coal-gas retorts to produce 460 B.Th.U. gas, the following proportions would be required:

	B.Th.U.
Coal gas, 1 part at 550	= 550
Mixed gas, 1 part at 370	= 370
	2)920
Final mixed gas	460

The heat balance then becomes—

Example 3.

	B.Th.U.
Coal for retorts, 16¼ cwt., at 11,811 × 550	= 5,273,400
Coal for mixed gas, 3¾ cwt., at 51,350 × 370	= 3,563,100
Heat units in gas	8,836,500
Coke for sale, 8 cwt.	11,612,160
Tar	2,000,000
Total heat units	22,448,660

This represents a heat efficiency of 74·8 p.ct., and gives approximately 19,200 c.ft. per ton of coal of 460 B.Th.U. gas. This result, from the point of view of thermal efficiency, is very similar to the last; but we have an increased yield of gas per ton of coal, and more heat units in a gaseous form.

In the above calculations, I have taken the figure of 12,960 B.Th.U. per lb. as the calorific value of the coke available for sale, which is the total heat in it. But as solid fuel loses a large percentage of its heat during combustion in flue gases and radiation, a considerable reduction in the above figures would have to be made when making comparisons with gaseous fuel.

Complete Gasification.

If we take up the attitude that as much as possible of the heat value in the coal should be turned into gas, the ultimate solution is to gasify the coal completely. This may be done by two methods—viz., in two stages (*a*) retorts and water-gas plant, or in one stage (*b*) complete gasification plant.

In the former case, the heat balance in good working would be somewhat as follows:

	B.Th.U.
Coal, 1 ton	= 6,500,000
Coke from above, ⅛ ton × 65,000 × 280	= 9,100,000
Tar	= 2,000,000
Total	17,600,000

The resultant gas would be about 360 B.Th.U. In the one-stage process at Harrogate, we obtained 18,920,000 B.Th.U. in gas over a seven hours' test. Adding 2 million B.Th.U. for tar, we get 20,921,000 B.Th.U. as the total heat units, practically 21 millions, per ton of coal. Higher results were obtained during two hours of the test; but I take for the purposes of this discussion the average over the seven hours.

Now, if the plant is regulated so that the coal carbonized is just sufficient to keep the generator supplied with coke, the quality of the mixed gas is about 370 to 380 B.Th.U. If we desire to produce 460 B.Th.U. gas, the yield of water gas is reduced by cutting down the steam supply. There is then a little surplus coke for disposal. *Vice versâ*, if a lower grade than 370 B.Th.U. is required, less coal is carbonized in the retorts, and some cold coke is fed into the generator. The limit of blue water gas dilution appears to be 33⅓ p.ct. if 460 B.Th.U. gas is desired; while with a complete gasification plant, we get 50 p.ct. dilution. As mentioned previously, if the complete gasification plant is regulated for 460 B.Th.U. gas, there is some coke for disposal, which I estimate at about 2 cwt. per ton.

The heat balance is then—

Example 4.

	B.Th.U.
Gas	18,000,000
Coke	2,903,040
Tar	2,000,000
	22,903,040

This equals 76·3 p.ct. thermal efficiency.

It will be seen from the foregoing that the total heat available by the different methods is 22 to 24 million B.Th.U. Out of the total 30 million B.Th.U. in the coal we get, in the above samples, the following percentages of heat turned out of the gas-works in the form of gas, taking the gas as 460 B.Th.U.:

(1) . . . . . 21·6 p.ct.
(2) . . . . . 27·2 ,,
(3) . . . . . 29·4 ,,
(4) . . . . . 60·0 ,,

The make of gas per ton and coke sold are:

(1)	Make 14,130 c.ft.	Coke sold 10 cwt.	
(2)	,, 17,725 ,,	,, ,, 8¼	,,
(3)	,, 19,200 ,,	,, ,, 8	,,
(4)	,, 39,130 ,,	,, ,, 2	,,

In the Clerk-Smithells-Cobb report of 1920, the following words occur:

> "It is obvious that the larger the proportion of the heat of the coal transferred to the station holder, the larger will be the receipts of the gas companies. That this increase is desirable is evident from the past history of the use of water gas in gas making. Very large gains would, however, result from increasing the gas heat in the holder from the present best value (25 p.ct.) to 50 p.ct.—double that value. This is readily made evident by a short examination of the accounts of the Metropolitan companies in 1913."

Let us now turn to the financial side, with the following basic figures:

Gas. . .	1 million c.ft. at 460 B.Th.U. = 4600 therms.
Coal	40s. per ton.
Coke	40s. " "
Tar	65s. " "
Liquor	*Nil.*

Example 1.—*Coal Gas Only.*

	£	s.	d
Coal, $\frac{4600}{65 \cdot 0}$ = 70·8 tons at 40s. . =	141	12	0
Coke, 35·4 tons at 40s. . . . . = £70 16 0			
Tar, 3½ tons at 65s. . . . . = 11 7 6			
	82	3	6
Net cost	£59	8	6

= 14·26d. per 1000 c.ft. made = 3·1d. per therm.

Example 2.—*Coal Gas* 2 *parts. Water Gas* 1 *part.*

	£	s.	d.
Coal, $\frac{4600}{81 \cdot 5}$ = 56·4 tons at 40s. . =	112	16	0
Coke, 24 tons at 40s. . . . . = £48 0 0			
Tar, 2·8 tons at 65s. . . . . = 9 2 0			
	57	2	0
Net cost.	£55	14	0

= 13·25d. per 1000 c.ft. made = 2·9d. per therm.

Example 3.—*Coal Gas* 1 *part. Mixed Gas* 1 *part.*

	£	s.	d.
Coal, $\frac{4600}{88 \cdot 4}$ = 52 tons at 40s. . =	104	0	0
Coke, 20·8 tons at 40s.. . . = £41 12 0			
Tar, 2·6 tons at 65s . . . . = 8 9 0			
	50	1	0
Net cost	£53	19	0

= 12·9d. per 1000 c.ft. made = 2·8d. per therm.

Example 4.—*Complete Gasification.*

	£	s.	d.
Coal $\frac{4600}{180 \cdot 0}$ = 25½ tons at 40s. . =	51	0	0
Coke 2½ tons at 40s. . . . . = £5 0 0			
Tar 1¼ tons at 65s. . . . . = 4 1 3			
	9	1	3
Net cost . .	£41	18	9

= 10·07d. per 1000 c.ft. made = 2·19d. per therm.

No labour costs have been taken into account, as no two places are alike, and each individual works would have to be dealt with separately. I am, however, convinced from my experience that in complete gasification the labour costs per therm are much lower, chiefly owing to the reduced quantity of material handled. Tar and liquor together in normal times yield only about 10 p.ct. of the total receipts, and very high figures would have to be obtained for these to affect the above comparisons to an appreciable extent. To make Example 1 equal to Example 4, coke would need to yield about 10s. 6d. above the price of coal.

COSTS ON A THERM BASIS.

The above calculations show the necessity of working-out costs on a therm basis, and support the contentions of Messrs. Clerk, Smithells, and Cobb. In the old way of working-out such costs, the make per ton was the factor; and it was frequently overlooked, when working this way, that a high make per ton meant a lower calorific value. Consequently, although the costs per 1000 c.ft. might be in favour of all coal gas, it did not by any means follow that the costs per therm did the same. I have therefore used as a starting point a definite quantity of gas of a fixed quality, not variable. In other words, I have taken so many therms as being required. This is to be our system for the future; and I am satisfied that, when selling on the therm basis, it is essential to gasify as much as possible, and get the therms into the holder.

If the production of coke increases, due to the increased use of gas for all purposes, where is the surplus coke to go? It will mean a reduced price in any case.

I will now come to the third point, and a most important one—that of capital expenditure. If we increase the yield of therms per ton in gaseous form, we use less coal and have less residuals to handle, as the above examples show. This means less haulage, fewer motor wagons and carts or railway wagons, smaller coal stores (or, conversely, increased storage accommodation for coal, also for tar and liquor), less carbonizing plant, smaller scrubbers and purifiers, no coke-handling plant, and smaller coke yard. Also, less plant to keep in repair, thus reducing labour.

In the case of Harrogate, the following extensions would be deferred several years if the maximum amount of gasification was carried out: Coal-store, light railway, scrubbers, coke motors and carts, coke-handling plant, representing in the aggregate £50,000, or about £3500 a year in interest, equal to ½d. per therm.

Let us picture for a moment what a gas-works would be like built for complete gasification, and making about 450 B.Th.U. gas, taking a works making 100 millions, or 450,000 therms, a year.

(1) Coal carbonized, 2500 tons a year.

(2) Coke available from plant, 200 tons a year.

(3) Steam used for exhausters, gasification plant and scrubber, generated by waste-heat boiler in part and by above coke.

(4) Other plant driven by gas-engines, or by electric motors, the current being generated by gas-engines.

(5) No coke-handling plant, no carts and horses, no motor vehicles, and a very small coke yard.

(6) Coal stores, one-third the usual size.

(7) Tar and liquor well, one-half the usual size.

(8) No unpleasant working conditions in the retort-house, and no nuisance to the neighbourhood.

(9) Less men and less anxiety.

(10) Cheap gas.

(11) Naphthalene troubles non-existent.

(12) Area of works only about 60 p.ct. of the usual.

This may seem Utopian; but it is, I venture to think, quite within the bounds of possibility in the near future.

It will be noticed that I have not dealt with steaming vertical retorts. I have not done so because other speakers will be able to discuss this better, especially those who depend entirely on verticals. From the financial point of view, when producing about 17,000 to 19,000 c.ft. per ton of 460 B.Th.U. gas, the cost of production would be similar to examples (2) and (3); but there would be an improvement in respect of liquid products.

The foregoing figures are assumed for the purposes of discussion, and, as such, are, I think, sufficiently accurate. For more detailed and accurate figures on this subject, the Clerk Smithells-Cobb report and the admirable paper of Mr. E. G. Stewart in March, 1920, are available; also, the recent reports before the Institution. These, however, are based on the particular coals used for the tests, and are dependent on local conditions, and I felt that, for our purpose, it was better to take figures which represented in some degree results obtainable in everyday working. The questions of waste-heat boilers, carburetting the water gas, producer gas, gaseous firing to retort-settings, capacity of distribution system, &c., although intimately related to the subject, I leave for others. I am convinced, after having gone into the matter, that this is a very big question, and one of the most important for us to-day.

Local conditions will decide to what extent gasification is to be carried; but I would go so far as to say that the passing of the Gas Regulation Act will compel suppliers of gas to obtain the maximum amount of heat units in the form of gas. Remember we are to sell heat, and not volume, which may vary in quality from 300 to 600 B.Th.U. Gas-works will become "gas" works in the true sense of the word. It is true a good deal of smokeless fuel would be taken off the market; but will not this be met by making gas so cheap and satisfactory that it can be successfully substituted for such solid fuel? You might say "But what about greenhouses, bakeries, smithy work, boilers, heating apparatus, and such like, where coke is now in regular use?" The reply to this is that gas can do the same work with less labour, more convenience, and greater cleanliness and efficiency. If not, what is the use of the propaganda work of the B.C.G.A.? Many managers are endeavouring to get manufacturers using coke to change to gas, and so realize the above advantages. In other words, they are spoiling their own coke market. More gas and less coke will make us more independent of the fluctuations of the coke market.

Now, gentlemen, I have thrown down the gauntlet. Will you take up the fight?

DISCUSSION.

The PRESIDENT (Mr. Samuel Tagg, of Preston) said the Council were much indebted to Mr. Robinson for his ready consent at short notice to prepare a paper on this important subject. He congratulated him on the broad summary he had submitted, and thought they would have a free and full discussion. The object of the paper and discussion was to obtain an opinion as to the economic heating value of gas that could be generally supplied, having regard to existing manufacturing and distributing plant and present and prospective values of raw materials and residuals. Mr. Robinson had asked from what point of view the subject should be approached. His (the President's) answer was from the standpoint of the consumer; for if they maintained a supply of gas which met the average requirements of the district at the lowest possible cost, they ensured financial stability and assisted the conservation of coal supplies.

Mr. Robinson had confined his examination to the net cost of materials used per therm of gas made; and while operating and capital costs were at least of equal importance, the question was so large that these other aspects might be taken as a basis for a future paper. He had assumed certain efficiencies for the various types of plant considered, and certain values for coals and residuals; and it might be of interest to compare these with known efficiencies which could be regarded as standard. For horizontal retort working the South Metropolitan costs, based on the carbonizing results given by Mr. Gill in his recent paper and accepting Mr. Robinson's values, would be 2·2d., compared with his estimate of 3·1d. per therm. For vertical retort working, the cost per therm based on the Fuel Research Board's tests on Mitchell Main nuts (Column G) was 1·9d. For blue water gas, assuming an efficiency of 70 p.ct., as obtained by Mr. E. G. Stewart with waste-heat boilers, the cost was 2·4d. per therm. Mr. Robinson had taken an efficiency of 76 p.ct. without waste-heat boilers, and his figures were open to this correction. From information kindly supplied by Mr. Bloor, the highest thermal efficiency he obtained in the gasification of oil in a carburetted water-gas plant was 1·4 therms per gallon, and with oil at 5d. per gallon the cost

per therm was 3·6d., and the cost of blue water gas enriched to 460 B.Th.U. was 2 6d. per therm.

Including Mr. Robinson's figure for the single-stage complete gasification, the relative costs would be as follows:

	B.Th.U.		Pence per Therm.
Vertical retorts	460	..	1·9
Horizontal retorts	550	..	2·2
Single-stage gasification	370	..	2·3
Blue water gas	300	..	2·4
Carburetted water gas	460	..	2·6

These costs were based on the assumption that the value of coke equalled the cost of coal; but before the war the average price of coke in many undertakings was 20 p.ct. less than the cost of coal, and there was no indication that better values would be obtained for coke in the near future. The relative costs on the lower coke values would be varied as follows:

	B.Th.U.		Pence per Therm.
Blue water gas	300	..	2·0
Carburetted water gas	460	..	2·2
Single-stage gasification	370	..	2·3
Vertical retorts	460	..	2·4
Horizontal retorts	550	..	3·0

These figures showed what was of course very obvious—that the net cost of materials depended very largely upon the residuals market, and that the determining factor was the value of coke. There was a lack of reliable data for the efficiency of processes for the complete gasification of coal; and he (the President) hoped it might be possible for the Institution to undertake an investigation similar to that on steaming in vertical retorts and the manufacture of blue water gas. At the present time the only advantage such plants appeared to have was in reducing the quantity of coke produced for sale. The ideal pictured by Mr. Robinson of a works producing gas only would relieve them of many anxieties; but the speaker thought it was impossible of attainment for financial reasons. So far as could be seen, there would be a permanent market for gas coke; for there was no other fuel available at a competitive price. The solution of the problem appeared to be steadily to cultivate the coke market, and to regulate manufacturing methods so as to prevent the depreciation of the market by over-production.

In comparing the relative costs per therm, he had not referred to the very important factor of the cost of distributing the various qualities, nor of their value to the consumer. Within quite recent years many undertakings had supplied gas of well over 500 B.Th.U.; and with this quality there was a difficulty in maintaining an adequate pressure at the point of consumption in old property where the pipes from main to burner were too small. He could not imagine that any engineer who regarded satisfactory service as an essential condition would contemplate under these conditions a material drop in quality to below 500 B.Th.U. Gas of a quality of 400 B.Th.U. would give service to the consumer equal to that of 500 B.Th.U., provided the volume of the lower quality was 25 p.ct. more than the higher. The supply of this increased volume involved an increase in the whole of the distributing plant from holder to burner; or alternatively, where this was in excess of requirements, an absorption of the potential value existing in the plant. The cost per therm of manufacturing the lower quality must therefore be appreciably below that for the higher, to compensate for the cost of enlarging the distributing system. The adherents of low-grade gas had made singularly few efforts to show that any such economy obtained. The claim was made that complete gasification effected the conservation of coal; but he thought this was based upon a fallacy. The truest conservation was effected by carbonizing the maximum quantity of coal with recovery of bye-products, and not by the complete gasification of a smaller quantity.

The President believed, however, their practice would tend towards increased gasification of coke, either by steaming in vertical retorts, the manufacture of water gas, or complete gasification plant. But the reason for this lay in its effect on coke values by avoiding over-production and not in any higher thermal efficiency which such processes might possess over the horizontal or vertical plants.

Mr. W. M. CARR (Ormskirk) said he had listened to the paper with considerable interest, and had tried to reconcile the points brought out with his own experience. The first thing which struck him was that Mr. Robinson appeared to have put his comparative prices too high. For instance, coke at 40s. per ton was a thing of the past. The same applied to coal at 40s. a ton; and, in considering the difference between complete gasification and present methods, they had to take into account the lower values that were sure to come in a short time. In his relative statements, he gave 10·7 cwt. yield of coke in Example 1, 10 cwt. in Example 2, and 9·8 cwt. in Example 3. He (the speaker) thought a fairer figure would be 11 cwt. per ton. If it was less, there was something wrong. During the past few years, the advantage of water gas had been very great indeed. But the conditions had been abnormal, owing to strikes and other causes; and he ventured to say that, in the majority of cases, it had not paid them. Personally, he was in the happy position of carbonizing in horizontal retorts with cheap coal; and he found himself with a coke yield of 32s. per ton, against coal at 22s. per ton. His net balance was not ¼d. per therm. These might seem extraordinary figures; but with his horizontal retorts, machine charged, he could buy fuel which could not be dealt with in the ordinary way. He could not agree that smaller scrubbers and purifiers would be needed in complete gasification.

Mr. J. H. BREARLEY (Southport) said Mr. Robinson had supplied plenty of material for discussion; but he thought at the end they would be very little nearer a solution of the question than when they started. One difficulty in the way of research was the absence of facilities for acquiring direct experience; and until they had examined into the price and cost of complete gasification, he thought most of them would prefer to suspend judgment. They must take every factor into consideration—not merely the thermal efficiency—and decide for themselves on practical results.

Mr. H. DAVIES (Chesterfield) said that the primary point was the relative price between cost and selling figures; and in discussing a matter of this sort, a fact that should not be overlooked was the capital cost entailed in making the gas. There was the question of labour charges and the relative value of residuals. No doubt, there were those who were manufacturing blue water gas who were making it out of the surplus coke which could be sold at a surplus price. There were many plants which were being worked on an unscientific basis; and on this ground he deprecated the introduction of blue water gas direct into the foul main. If they were going to use blue water gas, they ought to instal it on a scientific basis.

Mr. ISAAC CARR (Widnes) said he agreed with the President that the *crux* of the matter was the cost of coal and of residuals. It was impossible for any man to say which was the best system; for while one might be the best system to-day, another might be to-morrow. It was impossible for any one industry to control the cycle of commercial events which always would vary; and those engineers who were able to turn out a product to meet varying cycles of commerce, were the most fortunate. Looking at the figures put forward by the author, it might interest them to know that, with the facilities which he possessed, his costs per therm were a debit, and not a credit—*i.e.*, notwithstanding the great cost of coal at the present time, his residuals were paying his coal bill. They could not neglect this aspect of the question, and success or failure was largely a matter of circumstances. If a fairy were to build him an ideal plant such as the author had visualized, it would cost him £30,000 a year compared with his present operations. It was true he had a water-gas plant; but he could not afford to work it. [Laughter.] He had not vertical retorts, nor did he intend to have them; neither had he a "Pleno" gas plant, nor did he mean to have one. [Laughter, and "Hear, hear."]

Mr. J. A. GRAY (Ashton-in-Makerfield) said that the installation of a water-gas plant at small cost helped him over a great difficulty in November and December last year; and he knew of another small works in the West of England that had successfully installed such a plant. He could not understand Mr. Davies' remark about introducing blue water gas directly into the foul main. He would like to know why it was wrong.

Mr. DAVIES replied that the introduction of a water-gas plant might be a ready way of getting over a difficulty; but it was a wasteful way in a scientific sense, as they had no check upon it—no method of ascertaining the value going in, and no scientific control of the plant they had in operation.

Mr. ROBINSON, replying to the discussion, said the paper had had the effect he desired. As he explained at the beginning, he did not necessarily hold strongly to the views he expressed, and he agreed with Mr. Carr that circumstances altered cases. There was no royal road to gas making any more than anything else, and what might suit one works might not suit another. With regard to coke being the determining factor, as had been stated, of course it was all right so long as there was a good sale and it was not a drug on the market. As to smaller scrubbers, if they reduced the amount of coal to be carbonized they reduced the quantity of impurities to be dealt with. The system he had outlined was not so much complete gasification as maximum gasification. The question was whether they should turn out gas or residuals; and the answer, of course, depended upon local conditions.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Visit to the Works of Messrs. Parkinson and Cowan.

The members of the Western District of the Scottish Junior Gas Association, together with several senior gas engineers, paid a visit last Saturday afternoon to the Edinburgh works of Messrs. Parkinson and W. & B. Cowan, Ltd.

The party were received by Mr. Macleod, one of the Directors, and Mr. West, the Secretary, and were conducted through the works in small groups by the Works Manager and other members of the staff. In view of the visit, the Company had arranged with a number of their employees to work during the afternoon, so that the visitors might have an opportunity of seeing the various stages of manufacture and the steps taken to ensure good workmanship and accuracy. Primarily, the Company devote their energies to the manufacture of consumers' gas-meters of all descriptions—having, in addition to the Edinburgh works, factories in London, Manchester, Birmingham, Glasgow, Belfast, and in the Colonies; but they also specialize in station meters, station, governors, retort-house governors, pressure gauges, &c., &c.

Wet and dry consumers' meters (ordinary and prepayment), in all stages of manufacture, test and experimental meters, pressure gauges of all descriptions, and other gas apparatus were on view. A prominent exhibit was the "Duplex" wet meter, which is now being manufactured by the Company.

After the inspection of the works, a social entertainment followed, at which Mr. James Cubie (the President of the Association), Mr. James Jamieson (a Past-President), and Mr. James Dickson (of Johnstone) addressed the gathering; and Mr. Macleod, on behalf of the firm, suitably replied.

Cleaning Blast-Furnace Gas.—For some years past, the gas from the blast-furnaces and producers at the Pont-à-Mousson works has been cleaned by a dry process, improved in certain details by the Company's Engineer. The method is to pass the gas through vertical wire screens hung in frames. The dust is shaken from the screens by an up-and-down movement, and collects in a chamber below the frames. The gas, as it leaves the furnaces, contains about 6·5 grains of dust per cubic foot; but after passing the screens, this is reduced to less than 0·5 grain. It is claimed that the temperature of the gas only falls about 30° C. during the process.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Opening Meeting of the Session.

The Association opened their new session on Friday evening with a crowded meeting at the Westminster Technical Institute, Vincent Square, S.W.—the chair being occupied by Mr. FREDERICK A. FROST, of the South Metropolitan Gas Company, the new President.

The PRESIDENT, at the outset, expressed his sincere thanks to the members for having elected him President, and assured them that he highly appreciated the honour thus conferred upon him. Neither was he unmindful of the responsibilities which acceptance of the position entailed. These were of no light character, following, as he did, a number of Presidents of outstanding ability, who had occupied the chair with conspicuous success. He was, however, sure that the members would extend to him the loyal and hearty support which they had so unreservedly given to his predecessors. The programme arranged for the session was, he ventured to submit, one which would commend itself to them all. When preparing it, the Council had spared no pains to make it as varied and attractive as possible; and in order that it might be productive of the greatest amount of good, he appealed for large attendances. An outstanding feature of the programme was that on two different dates during the session three subjects would be dealt with the same evening. On these occasions they looked forward to very full discussions—not so much with regard to the length of individual contributions, but rather to the numbers taking part in them.

GAS-WORKS PRACTICE IN AMERICA.

The PRESIDENT said they were fortunate enough to have with them that evening Mr. G. M. Gill, the Chief Engineer of the South Metropolitan Gas Company, and a patron of the Association, of which he had been a keen supporter for many years. He had in various ways helped them in their work; and now he had kindly promised to open their new session with a lecture.

Mr. GILL remarked that he was very gratified to receive from their Hon. Secretary an invitation to give them an opening address; and he had asked the President whether it would be out of order to give a lecture, with lantern slides, on his American visit last year, which was made primarily for the purpose of studying carbonizing problems in the United States. He knew this was a somewhat unusual form of opening address; but he hoped the members would find it interesting. Mr. Gill then proceeded with his "Observations on Gas-Works Practice in America," which were profusely illustrated on the screen. Some points from the lecture are reproduced on this page.

The PRESIDENT, at its close, said they had had a very instructive and entertaining address, and were much indebted to the author for the great trouble he had taken.

On the proposition of Mr. W. NEWTON BOOTH (Woolwich Arsenal), seconded by Mr. D. C. CROSS (Lea Bridge), Mr. Gill was very heartily thanked for his lecture.

Mr. GILL assured the members that, if he had interested them at all, he was more than repaid for any trouble he had taken in the matter. If at any time there was anything he could to do to assist them in carrying on the work of the Association, he would be more than pleased to do it. He was a keen supporter of the Association, which he wished every possible success in the future.

A PRESENTATION.

The PRESIDENT said that the remaining part of the business of the evening, but by no means the least important, was the presentation of a framed illuminated address to Mr. Frank J. Pearce, their immediate Past-President. Mr. Pearce had, from his own personal knowledge extending over a number of years, been an energetic worker in all branches of the Association's activities. The highly creditable manner in which he piloted the Association through one of its most successful sessions, was a matter with which they were all perfectly familiar. It must have afforded Mr. Pearce the liveliest satisfaction to know that when he relinquished office the numerical strength of the Association was greater than at any previous time in its history. It was with pleasure that, on behalf of the members, he asked Mr. Pearce to accept the address as a token of their esteem and regard, coupled with their sincere thanks for the invaluable services he had rendered to the Association. The inscription concisely set forth these services:

> This testimonial, presented to Mr. Frank J. Pearce, records the esteem and appreciation of the Council and members of the London and Southern District Junior Gas Association of the valuable work accomplished by him during his year of office as President, 1920-21. His energy and enthusiasm have contributed very largely towards enhancing the reputation of the Association, and materially assisted in upholding its ideals and furthering its sphere of usefulness. Under his presidency, the membership has attained its highest level; and the position now occupied by the Association in the gas industry is ample proof of the capacity of its President. The members convey their sincere wishes for a successful career, and hereby express their best thanks for the services rendered.

Mr. PEARCE, in returning thanks, said he had been connected with the Association for many years; and it had always been a pleasure to him to do anything in his power to further the interests of what was now an important organization. He hoped to remain a member of the Association, and to have many opportunities of assisting in its good work.

OBSERVATIONS ON GAS-WORKS PRACTICE IN AMERICA.

By G. M. GILL, the Chief Engineer of the South Metropolitan Gas Company.

[Notes from a Lecture, illustrated by Lantern Slides, to the London and Southern District Junior Gas Association, Oct. 28.]

My visit to America last year was made primarily with the object of studying carbonizing problems in the United States. In this respect they have gone ahead in some ways, while in others they lag behind this country. Of course, there is much to be seen there that is of great interest; and though my chief concern was carbonizing matters, I saw a good many others things of value to gas engineers. Their engineering work generally is of an excellent character. The Americans are always helpful. They are willing to tell you anything, and to give you every facility.

WATER-GAS PLANT AND COKE-OVENS.

As you know, they make a very large quantity of water gas; and whereas in this country it would, perhaps, be average practice to make 70 p.ct. of coal gas and 30 p.ct. of water gas, there the position is reversed, and most of the companies are making much more water gas than coal gas. Oil has been plentiful and cheap; and so it has paid them to make gas in this way in America. But the position is now changing, owing to the scarcity of oil. Out there they are quite alarmed about the future prospects of oil; and there is a great tendency to increase the capacity of their coal-gas plants, either in the form of retorts or coke-ovens. The use of coke-ovens for supplying town's gas has been largely developed; and quite a number of gas undertakings either have coke-ovens of their own, or else they are buying this gas from the coke-oven works which are usually attached to steel-works. I was surprised to find in New York and the New York State, which embraces a large number of towns, that the quality of the gas when I was there was 22 candles, and well over 600 B.Th.U. The gas engineers there knew, however, that it was all wrong, and a waste of money; and they were taking steps to get it altered. In New York you have practically a smokeless city; and if you go to the top of one of their "sky scrapers," you can see a very great difference as compared with what would be the case in London. Anthracite is very largely used in New York. You are not allowed to burn bituminous coal. This was all engineered some years ago by the owners of the anthracite mines, who very skilfully worked-up a smoke abatement campaign, and introduced anthracite; but now that is getting scarce, and they are looking to coke to take its place in the future.

THE DOHERTY THREE-RATE SYSTEM.

In the States, a great many of the gas companies have amalgamated with the electricity companies. There must be scores of these combined undertakings; and they seem quite willing for electricity to supply the lighting and power, and for gas to do the cooking and heating. I saw very little gas lighting—it is practically all electricity; and many of the gas engineers over there realize what a mistake they have made in not putting up a bigger fight to retain the gas lighting, as they see now they could have done to a large extent.

A number of the undertakings in America charge for gas on a different basis from ours. It is known as the "Doherty Three-Rate System." Under this system, a consumer first of all has to pay a consumer's charge; and this may be something like 30s. or 40s. a year. Every consumer has to pay this. It is based upon the actual cost involved in supplying him, and includes such things as the reading of and attending generally to meters, making out the accounts, and quite a number of items of expenditure which the supplying of a consumer entails whether he uses much or little gas. After the consumer's charge comes the maximum demand charge. Each consumer has to state the maximum amount of gas he is going to take in any hour; and then he is given a limiting meter—which is really a governor—that does not allow him to take in one hour more than the maximum amount of gas declared. Say, for example, a consumer states that he is not going to use more than 100 c.ft. of gas an hour, he might have to pay as much as 2s. for each cubic foot per hour, making £10 a year. Having paid these two charges, the consumer then gets the gas itself priced-out at a very low figure. Thus, if he uses a great deal of gas it will work out more cheaply than if he uses a little. Mr. Doherty, who is quite a forefront man out there, is very keen on the system, which he is introducing largely. He told me it was having the effect of greatly increasing the consumption of gas.

LARGE COKE-OVEN PLANTS.

The coke-ovens in the United States, of which I visited quite a large number, are situated in many cases some hundreds of miles from the coalfields. They are placed where the coke and the gas are wanted, and not where the coal is. This is rather different from the system adopted over here. I was very surprised to see

the enormous size of the units of coke-oven plant. One at Clairton which I went over belongs to the United States Steel Corporation, and carbonizes 4¾ million tons of coal a year. This must be rather more than is carbonized in the whole of London by the gas undertakings. Another plant in Pittsburgh carbonizes 2 million tons; and the Bethlehem Steel Company, 1½ million tons. There are a large number like this. The coke-oven works of the Ford Motor Company carbonize 860,000 tons of coal a year; and they need all this coke to supply their own steel-works. You do not find plants of anything like these sizes in this country. The war gave a great fillip to this development in the United States. They were practically making the steel for the whole of the world, and had to put down plant to produce the necessary coke.

Seen in their Gas-Works.

One of the striking things out there is the great difference between the minimum output of gas in the summer and the maximum output in the winter. As you know, in the United States the temperature frequently falls below zero; while in the summer it is very much hotter than in this country. So you can imagine the nature of the problems they have to face. This is one of the reasons why they have so much water-gas plant. Not being specially interested in it, and having only a limited amount of time at my disposal, I did not go out of my way to see water-gas plant in operation; but I did come across some of these plants. At Boston I saw a very interesting test plant, attached to the water-gas installation. There, in connection with each consignment of oil, they first of all prove the exact temperature at which it should be split-up; and then, while using this oil, they work the plant at the temperature thus fixed upon. I was impressed with the improvement shown in their figures as a result of carrying out this plan. They work at very high blast pressure; and their generators are turning out a larger quantity of gas per square foot of grate area than anything I have heard of over here. In Philadelphia, I found three water-gas sets worked automatically by one operator. This automatic arrangement controlled every movement. The man was only there to see that the machine correctly carried out its functions. It appeared to be quite a practical piece of plant.

In the gas-works, I do not think I saw any machines which were not electrically driven. There were a large number of the projector type, and also Fiddes-Aldridge machines; but I noticed that on almost all the machines there was provision for weighing the charge before each retort was filled. In this way, the charges were made quite uniform. Such a method is not usual in this country; but I think it is a matter of considerable importance that you should be able to put in the charge just what you set out to do. I saw in Philadelphia a machine which discharges three retorts in one operation, and then charges-up the three also in one operation; but I was not very greatly impressed by it. There were single ascension pipes nearly everywhere. The coal carbonized has a very high volatile content—appreciably higher than the coal commonly used in this country. I dare say during the strike some of you had experience of American coal, which is, generally speaking, of high quality.

Silica Retorts.

I found in America plants which were turning out a good deal more gas per retort in 24 hours—roughly, I should say, 50 p.ct. more—than anything I have seen here. This I put down to the extensive use of silica retorts. In works after works, whether coke-ovens or gas-works, I came across plants with silica exclusively used for either retorts or ovens, and silica of very high quality. With a silica material, the heat is transmitted very much more rapidly than is the case when fireclay is employed. One engineer who had closely studied this problem told me his conclusion was that one could get something like 15 or 20 p.ct. more duty out of a silica retort, due solely to the better conductivity of the material. Apart from this, they are working at much higher temperatures than we have over here; and where it might, perhaps, be regarded as general practice to carbonize something like 1 cwt. per retort per hour in this country—some of us are doing a little better—over there it is somewhere between 1½ and 2 cwt., due to the higher temperatures and silica material.

I was not, however, much impressed with the way in which they burned-off their charges. In most cases it seemed to me that they could have done with another hour; but they do not appear to think very much about this.

Congdon Stand-Pipes.

There are quite a lot of Congdon scrubber stand-pipes in use. With this piece of apparatus, the retorts are connected to one pipe, and liquor is sprayed down the pipe, and carried off at the bottom, with anything which is picked-up out of the gas. With this in use, I saw no augering. The pipes seemed to be kept quite clear; and this is really what they are for—to save labour. Americans will save labour at almost any cost—at least, so it appeared to me.

The Doherty Bench Fuel Economizer.

There are installed in the States a number of what are known out there as the Doherty Bench Fuel Economizers. With this arrangement, you draw some of the waste gases from under the bottom retorts back into the furnace under the grate. It is sucked back by a steam jet, which also draws in the primary air. You are able to regulate the quantity of waste gas being drawn back in this way, and also the amount of primary air that is admitted. They work it to give something like 6 to 8 p.ct. of CO_2 under the grate. As you know, the CO_2 is again converted into CO; and in this way there is an economy. Also by this means you lower the temperature of the bottom of your grate, and thus save clinkering.

I came to the conclusion that, where the system was being carefully and intelligently worked, it was a success; but where it had been put in and the people did not understand what they were doing, it was a failure, as might be expected would be the case.

Dealing with Coke.

In two up-to-date works which I visited there are intermittent vertical retorts; and in both cases they are charged and discharged in one operation. There is 18 cwt. of coal put into each retort; and this is carbonized in twelve hours. They want this type of coke over there, where closed coke-stoves are very largely used—there being central heating systems all over the country. For this purpose, hard coke such as is made in an intermittent vertical retort is very suitable.

In one of the works referred to—at Hartford—the coke is dropped out into a little movable buggy, and is not quenched. The buggy feeds on to a gravity bucket conveyor, which carries it away and drops it into one of two large brick-lined receptacles, with sliding doors at the bottom. A lid is put on top of the receptacle, which is then quite air-tight. The coke may be kept there for some hours, until it is wanted for the water-gas plant, when it is taken away still red hot. I inspected some coke which had been thus stored for a considerable time, and it looked just as hot as when it came out of the retorts.

At this works, they have waste heat boilers, which quite successfully raise all the steam necessary for operating the plant. At the time I was at Hartford, there were eighteen men in all carrying out the whole of the coal-gas operations throughout the works for 36 million c.ft. per month. To get the coal into the works, there were 50-ton railway wagons; and in America you find these wagons all over the place. They drop the coal on to a belt conveyor running underground for a distance of 800 ft.

Nowhere did I see coke-breakers in use. In all cases the coke is screened, and to a number of sizes—as a rule to more sizes than you see over here, again because they make a feature of supplying the coke heating stoves.

Revivification in Situ.

At one works—Philadelphia—I found them revivifying the purifiers *in situ*. After the gas had been shut-off, the cover is left on, and a mixture of gas with a little air in it is blown through and re-circulated. Gradually more air is admitted. The outlet gas and air is then taken through a water-scrubber, where it is scrubbed in contact with water to cool and saturate it. So far as I could see, it was working very well. It had been in use for some years; and they said they had never had any trouble with it. However, it is a *sine qua non* that the outlet gas and air should be taken through a scrubber and cooled.

Holder Practice.

While in the States, I noticed that the holders are frequently used for advertising purposes; and this is, perhaps, not a bad idea. At one works near Boston, I saw a holder enclosed with brick walls all the way round, and with a roof over it. Certainly it was an old holder; but the engineer there told me it was built in the days of low costs, and the saving in not having to maintain a steam supply to keep the water from freezing was more than sufficient to meet interest and depreciation charges on the building.

The Labour Question.

Everywhere I found foreign labour; and this surprised me somewhat. The American will not do any labouring work. Practically all the labouring and domestic work is carried out by foreigners. In a gas-works, you will discover perhaps 80 p.ct. of the labour is foreign, and that the balance of 20 p.ct. will be Americans looking after them. I saw everywhere very large units of machinery. You can go into quite a small gas-works, and find that they have 2 or 3 ton grabs picking up their coal. Very little works are fitted-up just like our large works; while in New York they have 8-ton coal-grabs. Of course, the cranes are correspondingly large. They seem to want a man to do a job in two hours where we should be content to have it done in a day. It has to be remembered that the cost of labour over there is very high. At the time of my visit, stokers were getting about 30s. a day of our money; and although the price of gas was no higher, generally speaking, than it was over here, they were paying quite twice as much for their labour.

Natural Gas.

When I reached Buffalo, I found that the town was entirely supplied by natural gas, which has in it only about 2 p.ct. of inerts; while its calorific power is something over 1000 B.Th.U. There are no impurities in it; and therefore no purifying is necessary. It is supplied to Buffalo a distance of 150 miles from the natural gas wells, by means of 20-in. steel mains, at 200 lbs. pressure. In fact, the pressures used with natural gas are astounding. It does not give much trouble in use; but the danger is that it is difficult to introduce sufficient air to get complete combustion, and many people have been asphyxiated as a result of this. The gas itself is not so poisonous as artificial gas; and, as I have said, there is no sulphur in it.

The price when I was there was about 2s. per 1000 c.ft. The more natural gas you use, the higher is the price per 1000 c.ft. that you have to pay for it. If you only consume a very little, you get it at the cheapest rate. The reason is that the natural gas supply is petering-out; and this is their way of conserving it. Some years ago, you could acquire the wells for a mere song. No less than 3500 wells supply gas to Buffalo and the surrounding district.

While the photographs were being thrown on the screen, Mr. Gill explained a large number of other points in connection with them, and described various devices—including a trench-digging machine which is said to be doing excellent work. One of the slides bore the following intimation: "Clay refractories soften quite a while before fusing; silica material holds up to the point of fusion." Among the matters to which special attention was drawn were the following:

The Bradford Coal Breaker.

The Bradford coal breaker, so largely used in America, consists of a large rotary screen, having 1½ in. holes, and fitted with baffles, which alternately pick up and drop the coal, which breaks-up until it passes through the holes—iron, sticks, stones, &c., being rejected at the end. Small, under 1½ in., is then dropped into a disintegrator, which rejects iron by flinging it into a pocket filled with coal, in which it buries itself—the noise indicating that some iron has been caught.

Coxe's Mechanical Stoker.

Coxe's stoker is a splendid piece of apparatus, which does not seem to have been introduced into England. It will burn coke breeze, preferably screened through ⅜ in. mesh, and give a very high duty in evaporation per pound and in capacity. It has been proved on coke breeze on scores of works in America.

Setting of Retorts in Silica Material.

Important points in connection with the setting of retorts in silica material, as inspected by me at the Astoria works, are that ⅛ to $\frac{3}{16}$ in. expansion per 12 in. of silica must be allowed for, preferably by interposing layers of $\frac{1}{16}$ in. millboard between the pieces. In very hot zones, $\frac{3}{16}$ in.; at other parts ⅛ in. is sufficient. No clay or cement is used on either side of the millboard; the blocks and bricks are laid dry at these points. Fireclay joints are employed where millboard is not used. Where joints of blocks are diagonal or sloping, not being vertical or horizontal to the setting, they are tongued and grooved. This maintains the blocks in correct relative position when the settings are let down, at which times, when cold, the blocks are quite loose. Silica retorts can be patched with silica pieces when cold, but must be patched with clay pieces when hot. No exceptional precautions are taken when lighting-up. They claim that silica retorts charge and push out better.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Auxiliary Meeting.

The Fifth Half-Yearly Auxiliary Meeting of the North of England Gas Managers' Association was held at Darlington last Saturday, under the chairmanship of Mr. A. E. Ruffhead, Gas Engineer and Manager to the Corporation. The main object of the gathering was to pay a visit to the gas-works; but first of all there was an address by the Chairman.

Mr. Ruffhead, in the course of his remarks, said: As you are aware, unlike the majority of the gas undertakings in the North of England, the Darlington Gas-Works is a department of the Corporation; and therefore we find ourselves, particularly on the distribution side, in a somewhat different position from a gas company. Our gas-fitters are employed solely in fixing meters and gas apparatus on hire, and attending to complaints. All carcassing of new houses and fixing of consumers' pipes, fittings, and apparatus must be done by private plumbers. The sale, also, of gas cookers, fires, and other appliances—even mantles—must be made through a local tradesman, who often pockets his profit without having seen the goods—we taking the risk of having the showroom stocks left on our hands. On the other hand, the fact that we still hire-out cookers and fires, by order of the Council, at pre-war rentals, offers little inducement to consumers to purchase outright. I think you will agree, however, that we are considerably handicapped in our endeavours to develop to the full the sale and use of gas in the town. But, in spite of this, our output has steadily increased for many years past; and even during the past six eventful months, our make exceeded that of last year by 3½ p.ct.

We had our share of troubles during the miners' dispute, which cost the undertaking over £12,000, necessitating an increase in the price of gas to 4s. 1d. per 1000 c.ft. net, which, after all, compares favourably with that charged in other parts of the district. The general public, however, have very short memories, and have quite forgotten that they were recently glad to have gas at any price. Now that coal is cheaper, they ask why the price of gas does not immediately drop. The recent dispute has doubly hit the gas industry, by making it necessary to charge more for its staple commodity, to meet costs incurred through no fault of its own, at a time when solid fuel is much reduced in price. The coal-fire has obtained a new lease of life, and its ultimate ousting by gas is temporarily delayed. Meanwhile, we in Darlington are endeavouring to ensure the admixture of our own solid fuel, coke, which already has a local sale of 80 p.ct.; and we are indebted to the dispute for introducing us to a large number of new customers.

Two experiences during the dispute may be of interest. Our coal stocks being nearly at an end, I was induced to buy a consignment of "Belgian Unscreened." We used it freely for one week-end; and a proportion of it—the best imitation of coal I have ever seen—passed through the retorts, producers, and boiler fires unaltered. Consequently, the make fell-off, and the heats dropped alarmingly. We have no water-gas plant; and it took some time before we could get rid of this rubbish from our vertical retorts and bunkers, and put additional retorts to work on what remained of our British coal. With four holders empty, we watched the remaining one slowly settling-down until only two available sheets were left, when, fortunately, the turning point was reached, and we were once more masters of the situation.

This was a case when we had coal available but were unable to use it in time. During the last days of the crisis, however, when the dispute was over, expecting the arrival of a consignment of foreign coal, and having the promise of preferential deliveries from our own collieries, I was optimistic enough to resort to giving full pressure on the Monday morning—chiefly to enable several works, dependent on a gas supply, to start again. The foreign coal was delayed; and by the Wednesday we had less than two days' coal stock left. Not a single advice note from the English collieries was to hand. Should I again revert to reduced pressure? I rang-up the collieries. They all stated definitely that coal had left, or would leave for Darlington that day. I decided that some of it was bound to reach us in time, and we elevated a full day's supply of coal; but with only three-quarters of a day's supply left, and no water-gas plant, I will not disguise from you that next morning I went down to the works feeling anxious. I was met with the news "33 wagons of coal on the sidings." The situation was saved, and no one outside the works knew what a narrow escape we had had.

It has not yet been necessary to face the question of what calorific value we shall declare; but experiences during the dispute have inclined me to the opinion that the figure I originally thought of—namely, 480 B.Th.U.—can, by the aid of increased steaming or water-gas plant, be reduced to 450 B.Th.U., and that this quality of gas will be quite satisfactory to all classes of consumers. Thanks to the foresight of my predecessor, few towns have a better distribution system than Darlington; and, no doubt, it would stand a further reduction in quality, which means, of course, increase in quantity for the same service. But we must take into account the piping of consumers' houses, over which we have little control. Much of it is overworked at the present time; and I therefore feel the reduction in calorific value of town's gas must be a more gradual process than has been suggested of late by some engineers.

We must also take into account our own meters. Already we are finding it necessary, owing to the extensive use of gas-fires, to replace large numbers of three-light meters by those of greater size. Then, too, scarcely a day goes by without our having to remove a slot-meter and fix an ordinary. It may interest some members to hear that, rather than buy new three-light meters, I am removing part of the mechanism of three-light "slots" (of which we have a large stock), sealing up the slot-hole, painting them a distinctive colour, and putting them out in the district as ordinary meters.

Whether the exceptional weather of the past summer is partly responsible, I do not know; but certainly the number of naphthalene stoppages in the services has been abnormally low; and, though I recognize that this elusive substance may yet turn-up unexpectedly, I feel sure that some amount of benefit has been derived from the atomizing apparatus installed some eighteen months ago, by which we can spray the town mains, or those leading to the holders. We use motor spirit residue or even petrol, which gives better results than paraffin; and the gas pressure used is 40 lbs. per inch.

All the street-lamps of Darlington are lit and extinguished by "A. & M." pressure controllers. We have a high-pressure gas installation, which chiefly supplies the railway station, besides some few street-lamps and outside shop-lamps.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

General Meeting at Chepstow.

INSTEAD of the usual two meetings of the Institution this year, owing to the disturbed conditions at the time when, in the ordinary course, the first would have taken place, it was only possible to arrange for one; and this was held last Thursday at Chepstow. A warm welcome, with generous hospitality by the Gas Company, a good meeting, and beautiful weather combined to make the day a complete success—as all expected it would be who remembered the previous occasion, eight years ago, on which the Institution visited the town. With some ladies, the hundred mark must have been passed by those who took part in the social portion of the programme; and in looking after the comfort of everybody, Mr. JAMES ROBB, the Engineer, Manager, and Secretary of the Chepstow Gas Company, was quite in his element. At the opening of the proceedings, the chair was occupied by Mr. J. H. CANNING, of Newport, the outgoing President.

The business meeting was held in a room which had been placed at the disposal of the members in the Beaufort Arms Hotel.

Mr. J. H. CANNING (Newport), the outgoing President, calling the meeting to order, remarked that the programme was a long one; but he felt they could not proceed to its consideration without first extending a welcome to two visitors who were present—namely, Mr. Walter T. Dunn, Secretary of the Institution of Gas Engineers, and Mr. W. M. Mason, Manager of the British Commercial Gas Association. The Institution were greatly indebted to the Chepstow Gas Company and the town, for receiving them on this occasion.

A WELCOME.

Col. EVILL, D.S.O. (a Director), assured the members that it had been a very great pleasure to the Chepstow Gas Company to invite the Institution to visit the town. He trusted that, after their deliberations, they would spend a pleasant afternoon, and that, mixed with their business, might be some memories of a happy visit to the town with their lady friends.

Mr. JOHN HALL (the Chairman of the Chepstow Urban District Council) said that, on behalf of the Council and the town, he heartily welcomed the Institution on the occasion of this their second visit. Since the time of their previous visit, there had been many vicissitudes to pass through; but he hoped soon they would all find themselves on their feet again, and that the future would be more prosperous than the recent past. He understood that the Gas Company had just been installing some new plant, and thought it said much for their optimism that, in the present state of affairs, they should have undertaken this extension. He hoped the enterprise would prove a source of profit to themselves and of satisfaction to the consumers.

MINUTES OF THE LAST MEETING.

The minutes of the last meeting were then taken as read and confirmed.

NEW MEMBERS.

The following new members were elected, on the proposition of Mr. A. ROSSER, seconded by Mr. J. STEPHENSON: Messrs. Stephen King, Manager, Gas-Works, Abersychan; Brooke Gibson, Gas Engineer, Caldicott; Clifford M. Gibson, Assistant Gas Engineer, Caldicott; Robert H. M'Gregor, Engineer and Manager, Brecon Gas Company.

ANNUAL REPORT.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) then read the sixteenth annual report of the Council, which stated that during the past year Mr. T. H. Hazell, the Secretary of the Newport (Mon.) Gas Company, was elected an honorary member. Eight honorary members and four students have joined the Institution, one member has died, and three have resigned, leaving the number at the end of the year 76 members and 5 students. The receipts for the year amounted to £48 6s. 6d., and the payments to £28 8s. 1d., leaving, with the balance brought forward from the previous year, the sum of £56 16s. 8d. in the hands of the Treasurer. The Council wished to place on record the excellent work done by the National Gas Council and the Federation of Gas Employers during the past year, and strongly urged those members who have not joined to do so.

Mr. CANNING said he thought the financial statement might be considered highly satisfactory, in view of the difficulties of the war and the period which succeeded it. Generally speaking, they would agree that the Institution was in a flourishing condition.

On the proposition of Mr. A. J. BOND (Aberavon), seconded by Mr. D. J. DAVIES (Haverfordwest), the report and accounts were adopted.

THE NEW PRESIDENT.

Mr. CANNING remarked that he had now come to the most pleasant portion of his duty that day, which was to propose the election of the President for the ensuing year. He was sure he had only to mention the name of their friend Mr. Robb, of Chepstow, to secure its hearty acceptance by them all. Had time permitted, he would have liked to say a good deal in regard to such an old and esteemed friend as Mr. Robb. It was quite unnecessary to point to his technical ability and commercial aptitude, as these qualities were well known to the whole of the members. But he would like to dwell particularly upon his personality. Mr. Robb possessed a most genial and winning personality, and an intensely human one, and had made his way to the hearts of all of them; and they could not possibly confer the honour upon one more worthy.

Mr. J. E. KENSHOLE (Merthyr Tydfil), in seconding, remarked that Mr. Robb was one of the first members of the Institution, and was as well known as he was greatly respected by all.

Mr. JAMES ROBB (who on taking the chair was warmly greeted) said he was very much indebted to them for electing him President, and for the kind words that had been spoken; but he felt himself in a difficult position, because he was a very diminutive man in the profession, and was succeeding a very eminent gentleman. It had been his pleasure last year to propose Mr. Canning for the presidency; and he then said he (Mr. Canning) was an "indispensable," and would shed lustre upon the chair. Now they all knew his prediction had come true to the last letter. Of all the trying years since 1914, the one just closed had been the year which had most tested their abilities. When they read report after report of the thousands upon thousands that the gas undertakings throughout the length and breadth of the United Kingdom had lost through the foolish and disastrous coal strike, and the abnormally high prices of all materials and labour, it was a wonder that any of them were there to tell the tale. But they were there; and South Wales emerged from the strife the most triumphant of all the districts. Some of them got a few scratches and injured limbs in the fray; but as a whole the supply of gas was well maintained. How could it be otherwise? Mr. Canning was at their head. The Institution were under a deep debt of gratitude to him; and he proposed a hearty vote of thanks to Mr. Canning for his able and efficient leadership and conduct in the chair during the past year.

Mr. H. D. MADDEN (Cardiff) said it gave him great pleasure to second the vote of thanks, because for a long time past the name of Canning had been associated with the South Wales Institution—Mr. Canning's late father, himself, and now a son following in his footsteps was with them that day.

The PRESIDENT mentioned that this was the second time Mr. Canning had occupied the chair; and he earnestly hoped it would not be the last.

Mr. CANNING (after the vote had been heartily passed) said he need not tell them how deeply he felt the kind way in which both the President and Mr. Madden had spoken of him, and of the few services he had been able to render during the past year. He did not agree with Mr. Robb's self-depreciation, and was sure that in him they would find an admirable President. He would like to say that, as his own year of presidency had coincided to some extent with what he believed was the turning-point of their fortunes, so he hoped Mr. Robb's term of office would see them on the full flood-tide of prosperity.

OFFICE BEARERS.

The following is the full list of officers elected:

President.—Mr. James Robb, of Chepstow.
Vice-President.—Mr. Evan Rees, of Margam.
New Members of Council.—Messrs. W. H. Johns, of Swansea, and G. Mayne, of Mountain Ash.
Hon. Treasurer.—Mr. Henry Morley.
Hon. Secretary.—Mr. Octavius Thomas, of Pentre.
Hon. Auditors.—Messrs. J. P. Jones and F. Hill.

THE BENEVOLENT FUND OF THE INSTITUTION.

The HON. SECRETARY proposed that their Institution should make a donation of five guineas to the Benevolent Fund of the Institution of Gas Engineers. At the same time he appealed to the members individually to support so worthy an object.

Mr. BOND having seconded the proposition,

The PRESIDENT remarked that he was sure they would like to hear a few words on the subject from Mr. Dunn.

Mr. W. T. DUNN said he would first like to tell them how grateful he felt for the kind welcome that he had received. As Hon. Secretary of the Benevolent Fund, he was sure that few words were needed from him to the members of the Wales and Monmouthshire Institution, because many of them already subscribed to this excellent fund. It was not possible to make public the circumstances of the cases dealt with; but he could assure them, on behalf of the Committee, that every case was very carefully scrutinized, and that the Committee granted the utmost that the money at the disposal of the fund would allow. He would like on their behalf to thank the Institution for the grant just made; and if he might add a word to what Mr. Thomas had said, he would express the hope that anyone who did not already

individually subscribe, would consider the possibility of assisting so worthy a cause. He knew there were many calls to-day on one's charitable purse; but for the sake of those in the gas profession who had fallen upon hard times, he would put in an earnest plea.

The resolution was carried.

REPRESENTATIVE ON THE INSTITUTION COUNCIL.

Mr. GEORGE CLARRY (Cardiff) proposed, Mr. T. H. HAZELL (Newport) seconded, and it was agreed that the President should represent the Institution on the Council of the Institution of Gas Engineers for the year commencing in June, 1922.

THE PRESIDENTIAL ADDRESS.

The PRESIDENT pointed out that usually the Presidential Address came in at this part of the programme; but this year, owing to the two meetings having been amalgamated, it had been arranged to defer his address until the next May meeting.

THE GAS INDUSTRY IN SOUTH WALES AND MONMOUTHSHIRE.

Mr. H. D. MADDEN (Cardiff) then read a paper in extension of the one which was presented by him, but not fully discussed, at the meeting held in June last year—see "JOURNAL" Vol. CL., p. 725. This further paper, with a report of the discussion to which it gave rise, will be found on this page.

A WORD ON THE SELLING SIDE.

Mr. W. M. MASON, on being called upon, expressed his gratitude for being permitted to attend, and said it was a particular pleasure to be at such a live meeting as this. The two points he wished to lay before them were very specific; and what he wanted to suggest would come very appropriately after what Mr. Madden had so well put before them. One of the big leaders of the industry at a recent meeting, where one would have thought he would have emphasized the engineering side, and the fact that profits are made in the retort-house, took the opportunity to lay stress upon the absolute necessity of good salesmanship. He did not, of course, say a word against engineering; no one would do anything of the kind. But they must not forget the other big side. Though profits might be made in the retort-house, or might be lost there, the selling side of gas was the big side to-day; and they as gas managers—he said gas managers rather than gas engineers—had to devote perhaps two-thirds of their time to the business side, which covered largely the sales side. The first matter to which he wished to direct their attention was a proposition for a big national exhibition to be held in Cardiff during next summer. In connection with this project, it was felt that gas should be fully represented. This would mean a big thing, if it was to be properly done; and the suggestion he had to put to them was that it should be properly done. Reference had been made to the possibility of the best brains among the rising juniors going to the other side. This might happen sometimes; and good selling brains might go, as well as good engineering brains. They were up-against competition which was already very keen, and was going to be very much keener; and they must keep the selling side well to the front. Therefore he suggested that the proposed exhibition was not a matter merely for Cardiff. Of course, Cardiff quite naturally led in many respects; but he urged them to consider that this Welsh exhibition was a thing for every single gas undertaking in Wales to support to its utmost ability. Everyone would benefit from it. The whole of the gas industry in South Wales was bound to gain by such a display; and he did want to appeal to them as a combined and very live district to support the proposition in every practicable way. His second point was more a "B.C.G.A." matter at the moment. Last year the Association did not have any District Conference in Wales. That is to say, there was no meeting at which selling subjects could be thoroughly discussed. He suggested that they should try to arrange a District Conference, which it might perhaps be possible to work in in connection with the Welsh exhibition. At such a conference publicity matters could be adequately presented. Reference had been made that morning to optimism. They needed to be optimists; and there was abundant room for it. There was scope for increased gas consumption in all directions.

THE "SIMPLEX" CARBURETTED WATER-GAS PLANT.

Mr. E. LINSLEY then read the paper reproduced on p. 382, dealing with the subject of the "Simplex" carburetted water-gas plant, just installed at the Chepstow Gas-Works.

The PRESIDENT suggested that any questions which might arise out of the paper could be better answered during the subsequent inspection of the plant at the works.

VOTE OF THANKS.

Mr. EVAN REES proposed a vote of thanks to the readers of the papers, which he remarked was thoroughly well deserved.

Mr. R. G. CLARRY, in seconding, said Mr. Mason had referred to the question of optimism in the gas industry. It might interest them to know that he (Mr. Clarry) had been able to look at the industry in a different perspective the last year or two; and the impression he had gathered was that, from the world-wide collapse of trade, the gas industry would be the first to come round, and that it had already turned the corner.

PLACE OF NEXT MEETING.

It was resolved that the place of next meeting should be left to the Council.

This brought the business portion of the day's proceedings to a close; and an adjournment was made for luncheon in the hotel, by invitation of the Chairman and Directors of the Chepstow Gas Company. Members had been asked by Mr. Robb to bring ladies with them; and altogether a party of about a hundred sat down to table—with Mr. T. B. Pearson (the Chairman of the Gas Company) presiding. Time did not permit of any speech-making; and the Loyal Toast was the only one submitted.

AT THE GAS-WORKS.

A move was then made to the works, the main product of which Mr. Robb is in the fortunate position of being able to sell, and his consumers to receive, at a rate which, under prevailing conditions, is remarkably low. Here they were taken in charge by Mr. Robb and his son Mr. Jack Robb (who is Assistant Manager); while points about the new plant were explained by Messrs. T. Alborn Clapham, Clifford H. Hunt (Directors), and Mr. E. Linsley (Managing-Director), of the Vertical Gas-Retort Syndicate, Ltd., and Mr. G. Coutts, of Messrs. George Waller and Son, Ltd. The new plant comprises, in the first place, a 75,000 c.ft. per day "Simplex" carburetted water-gas plant put down by the Vertical Gas-Retort Syndicate, on the subject of which Mr. Linsley had earlier in the day read a paper. This the visitors were able to see in operation.

The main feature of the "Simplex" plant (which is claimed to be specially suitable for small and medium sized gas-works) is a brick generator without any casing. This can be put full depth below ground, so that the top is level; 8 ft. below ground (as at Chepstow); or entirely above ground, without any subway at all. There is a "Sydenham" grate [particulars of which were given in the "JOURNAL" for April 20 last] at the bottom of the producer, and a charging door at the top. With the "Sydenham" grate no clinkering is required; it is simply a matter of clearing out a few ashes at intervals. It was noticed that the amount of ground space covered by the plant is very small. Gas is taken from a certain distance down the generator—getting the off-take in the proper position makes all the difference—through an arch pipe into an hydraulic main. The top of the ascension pipe is fitted with a stack valve; while the bottom of the dip-pipe in the hydraulic main is provided with a cone valve. These two valves, as well as the air-blast and the steam supply, are controlled by means of a shaft operated by a hand lever. This one action does the whole thing. There is a seal regulating valve on the off-take of the hydraulic main, for keeping a level gauge. The carburettor is simply a plain cylinder, without any filling. The ascending gases meet a jet of tar, which is vaporized and blown in by superheated steam. The enriched gas then passes away either to the holder or to the foul main; and the residue is caught in a seal pot. The arrangement is such that it is found that by closing-down at night practically no coke is lost.

In connection with the plant there is a Davey Paxman locomotive-type boiler, fitted with a Goodrich and Hamlyn grate for burning breeze and rubbish. An exhauster is necessary at Chepstow, because they are working into a holder; and a steam-engine and exhauster, with a capacity of 5000 c.ft. per hour, have been installed by Messrs. George Waller and Son. A Sturtevant fan supplies the blast. In another part of the works, Waller and Son have installed a gas-engine driven booster.

The remainder of a gloriously fine October afternoon was devoted to a very enjoyable drive in motors to the houses and gardens of Mounton and Mathern Palace; the party being thus thoughtfully afforded an opportunity of admiring the best in both old and new. This is the second time that Mr. H. A. Tipping has thrown open his gardens to the members.

Tea on the return to Chepstow brought a well-filled day to a close.

THE GAS INDUSTRY IN SOUTH WALES AND MONMOUTHSHIRE.

By H. D. MADDEN, of Cardiff.

In view of the fact that there was insufficient time for any discussion of the paper I presented at our last meeting, some sixteen months ago, our Hon. Secretary persuaded me to extend the paper, in some detail, so that the original paper and the further notes in connection with it might be taken together for discussion to-day. As some time has since elapsed, and also because of the strain of the occurrences which have taken place in the intervening period, the writer would like to recapitulate the headings of the various points contained therein.

The paper directed particular attention to: (1) The peculiarities and carbonizing effect on South Wales gas coals, and their low volatile content, as compared with the Midland and Northern coals. (2) The properties of tar and ammonia production from these coals, and the question of possible improvement in the quantity and quality of the residuals by studying the carbonizing conditions, &c. (3) The possible effect of the Gas Regulation Act, which, at that date, had not been passed by Parliament. (4) Efficiencies in the distributing system and apparatus used by consumers. (5) Detail supervisory efficiencies in carbonizing and general manufacture, and the far-reaching effects of same. There was also a hope expressed that the Wales and Monmouthshire Institution might arrange two or three purely informal meetings per annum wherein prearranged questions can be discussed, and the information obtained by joint investigation pooled and utilized for the advancement and benefit of the industry and consumers.

The advantage of technical training and the practical use of technical assistants in the supervision of the details of routine manufacture was pointed out; as also the need of the juniors in the South Wales and Monmouthshire area having more educational facilities, and a District Junior Gas Association.

Complying with the request to extend these into more detail, I am almost prompted to co-ordinate all the points and crystallize them under the title of the "Study of Efficiencies." This was exactly in the writer's mind when he prepared the original paper —efficiencies, especially relating to South Wales and Monmouthshire coals, their manufacture, and the distribution of the resultant products.

The Gas Regulation Act is now the basis of the conditions of manufacture and the sale of gas. Coals, therefore, must be carefully examined, not only for the old cubic feet per ton figure, but for the thermal production per ton; and I venture to say that this new standpoint will considerably alter the viewpoint in the selection of carbonizing coals in the district. We must consider: (*a*) Therms per ton of coal carbonized; (*b*) therms produced per retort per day; (*c*) cost of production per therm. We must think in therms, and endeavour to standardize our comparisons on the same lines. The retort-house and carbonizing plant will engage considerably more attention in the near future, as we become more familiar with the idea of production of therms from the coal; and it is obvious that the greater the number of therms produced per ton of coal carbonized, so rises the working efficiencies.

In most works it is almost a physical impossibility for the engineer or his assistant to keep his carbonizing plant in all its details up to the highest concert-pitch by devoting whole-time attention to it, as so many other matters call for supervisory attention. Recognizing this factor, some two years ago we tried an innovation—an assistant chemist in each retort-house, technical assistants who had received good chemical and physical training, and experience of coal-testing plant. Laboratory chemistry and physics were directed to the practical application of chemistry on a commercial scale. Daily detailed routine investigations were set-out, so that it became possible to have recorded throughout the day the following data:

1. Heats of the combustion chamber and retort.
2. Pressures, &c., existing in retorts and ascension-pipes.
3. Temperatures and heat losses at the outlet of the waste-gas flue.
4. Analysis of gases in the waste-gas flue.
5. Weight of the charges laid and the conditions of the spent charges.
6. Volatile matter in the coke.
7. Calorific value, specific gravity, and analysis of the stream of gas.

The close following of these and other items enable us to see instantly if any retorts or settings are not working to the highest efficiency. It is so easy, unless very close technical supervision is given, for any manufacturing plant to start degenerating in efficiency. When this change takes place, the change at first is almost imperceptible; and it may go on for some little time with losses occurring, gradually increasing in extent with consequent larger losses, until it is easily manifest.

Without labouring the point, so many items in the efficient working of settings will occur to you (in addition to the above) which it is necessary for good working to watch day by day. The use of pyrometers, pressure gauges, and other instruments in carbonizing practice more than pay for their adoption.

The question of waste heat in carbonizing is receiving very close attention by some of the ablest minds in the industry, and I venture to believe that we are fast approaching the day when even much more in the shape of heat conservation will be effected. In horizontal settings, it is almost possible to bring the waste gases down to such a temperature by careful regeneration and regulation that they are practically of no service for steam-raising. This point was carefully investigated some little time ago by Mr. Canning, of Newport.

In regard to vertical retorts, the method of gaseous firing in vertical flues offers a good field for the utilization of the temperature of the waste gases for steam-raising; and while I have not yet seen this in operation, I believe it is now a generally accomplished fact, and working very efficiently. In water-gas plants, the thermal losses in present-day plants are very great; and I believe we shall shortly see the conservation of this waste for steam-raising purposes.

As a matter of interest to the Institution, I may say that in our extension of the water-gas plant at the Grangetown works, my Company have decided to incorporate a waste-heat boiler with the plant which is now in course of construction. Not only this, but several other factors for supplying the generator in such a way that the steam is not unduly cooled by the cold coke. These factors are of importance and an economy in working, and will probably interest the Institution when they next visit the Grangetown works.

I should also like to refer to the peculiarities of South Wales coals, and their technical nature, as compared to Midland and Northern coals. While undoubtedly we have some of the best coking coals, we are generally faced with the problem of coals of low volatile matter. These have to be carbonized under all conditions; and a great deal of knowledge and data are undoubtedly collected at the different works throughout the Principality.

May I reiterate an old wish that in regard to questions relating to carbonizing and all details of manufacture, &c., we as an Institution might have the opportunity of meeting informally—say, two or three times per annum—to discuss specially selected points and collect the data for reference. The point or points under review might be notified to each member by our Hon. Secretary a couple of months before the meeting, each member then examining and investigating this point as thoroughly as possible. At the informal meeting the matter could then be thrashed-out, the information carefully examined, and the salient points recorded. In this way, we should be able to compile a book of statistics of the effects of the methods of manufacture, &c., on the whole of the local coals. Of course, many other questions could be dealt with; but the benefit would be that the whole of the members of the Institution would be seeking after the truth of one particular question throughout one particular period. It would certainly co-ordinate thought, and ultimately benefit the industry and the consumer.

Regarding distribution—a most vital question of efficiency that acts or re-acts for or against our welfare. In the distribution of therms, it must, in the first place, be remembered we are going to use the same distributing system as we had before for cubic feet. The following points must not be lost sight of:—

1. The careful laying of trunk mains.
2. The ample size of service mains and pipes.
3. The proper capacity of consumers' meters.
4. The proper size, shape, and condition of the house carcasing.

These are all points that must be carefully watched for efficiency and satisfaction.

Coming to fittings and appliances, these should be capable of giving the highest efficiency; and with the varying composition of the gases sent out in each area of supply, it does appeal to the writer that it is advantageous that each undertaking should have an appliance test room in which all apparatus could be tested on the town's gas, and the air regulation set to give the consumer the best results obtainable from the gas consumed. All service in this direction means satisfaction.

It will be surprising to make a study of the old mains and service-pipes that have been in the ground for many years. The condition of the service-pipes in some ground would mar the efficiency of the best gas and the best fittings. Internal and external corrosion affect the gas-ways; and many a complaint is due to rust, water, or clay which has found its way into a decayed service-pipe. A clear flow and good volume from the main to the point of combustion are to be aimed at.

While on this subject, I would like to bring forward the question of technical training, and the excellent opportunity afforded to all ranks by some course of study for their particular branch of the industry. So far in this part of the country, we have not had such good facilities for the Juniors as exist in the Midland, Northern, and London areas; but from the retort-house to the burner, technically trained minds are more than valuable. While chemistry and physics are pre-eminently necessary at the works, on the distribution side a knowledge of applied chemistry and physics is of great benefit on all hands.

I have been asked by our Hon. Secretary (Mr. Octavius Thomas) to bring before you what has recently been arranged with the Cardiff Technical College. As you are probably aware, one of our members, Mr. George Clarry, is Deputy Chairman of the Technical Instruction Committee of the Cardiff Corporation. For some years past, a course of gas-fitting and plumbing has been in operation; but our Institution has recently approached the Technical College authorities and requested that a course for gas engineering and gas supply be arranged. As the season is now rather far advanced, the matter has been expeditiously dealt with; and while it was not found possible to start both subjects, it was thought advisable, as a foundation and beginning, to commence with a class of ordinary gas supply. From this beginning, if supported wholeheartedly by the Institution, we should have a strong centre for the training of all types of staff for a large area of the surrounding district.

Again, there is no junior organization for Wales and Monmouthshire, which is to be much regretted, because the workings of these organizations do much to foster development and interest in all branches of the work. I venture to hope that a Junior Association will spring-up with the classes referred to above, and be an additional means of aiding and educating the whole of the juniors in the details of the branch in which they are particularly interested. The writer feels sure that the Wales and Monmouthshire Institution will give its aid to the development of such a movement. Any educational arrangement that will quicken interest is a most valuable asset towards the application of knowledge and efficiency.

All efficiencies must have a direct bearing or benefit to all parties concerned—*i.e.*, the owners of the undertaking, the consumers, and the employees. Dr. Carpenter, of the South Metropolitan Gas Company, in his adoption of the principle, almost prompts one to refer to it in the engineering phrase, as the triangle of forces the resultant being the line of ideal service through efficiency. After all, the human element must be primarily considered in all branches, and a quickened interest from works staff to the gas-fitters is the right road. But the great prime mover of all human enterprise is the embodiment of a soul in the work. Many of the great combines, although powerful, have never reached the ultimate success they anticipated, because the human element has been overlooked. One is almost prompted

to think that this is the cause of the failure of the great effort made by the large trade unions when they were amalgamated. Numbers they had in millions, but the soul was absent. In reference to this, which to the writer's mind should be the guiding principle of all works, the co-partnership spirit on the one hand and the trades guild arrangement on the other are the leading steps towards mutual interest, quickened ideals, and an ultimate high standard of efficiency.

DISCUSSION.

The PRESIDENT (Mr. James Robb, of Chepstow) remarked that the paper had come at a very opportune moment. Mr. Madden had given them food both for reflection and investigation, with a view to preparing them to meet the changed conditions by which they were confronted.

Mr. J. H. CANNING (Newport) congratulated Mr. Madden upon the paper he had presented, and added that he thought they also were to be congratulated upon being in a position to receive such a paper from one of their members. The great test of a paper to his mind was the inspiration it gave to discussion; and it was always, not only a pleasure, but easy to discuss any paper given by Mr. Madden, because it was sure to be full of suggestive points. As, however, time was limited, he would confine himself to two or three of the more salient matters. The first was the question of South Wales gas coal. This affected every one of them. The physical properties of these coals were matters of very great concern to those who had to deal with them; and for some considerable time past it had appeared to him to be questionable whether carbonization pure and simple was the best method of dealing with the South Wales coals. The Northern coals responded well to the system of pure carbonization; but he thought in this district they might consider whether mixed methods would not be best. They should welcome, therefore, a pooling arrangement, which would be of advantage to every one of them, as well as to the industry. As they were aware, the Gas Regulation Act had altered the whole of the conditions under which they had to supply gas. At the Brecon meeting, before the Act was passed, he ventured to draw attention to the importance—if they were compelled to turn out heat units, and if they were to be paid by heat units—of seeing that, in turn, the coal contractor supplied them with coal that was able to yield these heat units. ["Hear, hear."] He thought that this really was the most important thing with which they had to deal at the present time. Hitherto they had been content to be passive to some extent in the matter; but there were certain points now which had added importance—such as yield in therms and also ash content, from neglect of which they had suffered so greatly during the war. He could spend much more time than there was to spare at present in dealing with this one point alone. The damage it had done the industry was infinite. To mention one little matter only, in connection with horizontal retorts and push dischargers, the friction set-up between the walls of the retort and the charge of coke which had an excessive ash content was enormously greater than that in the case of a clean coal. This was a consideration which had a profound bearing upon the important matter of repairs and maintenance. It simply emphasized the point Mr. Madden had brought out so clearly—namely, that the art of carbonizing was the taking of infinite pains with regard to even the smallest details. It was not every works that was large enough to be able to employ a chemist in the retort-house; but he certainly would make a plea that, as far as possible, they should all endeavour to exercise the most careful technical supervision of this part of the work. Once they had completed the carbonization of coal, there was nothing further which they could do to alter the results; and hence he felt that technical supervision of this important part of their operations would be amply repaid. There was another point he would like briefly to refer to. When Mr. Madden presented his original paper to them, they would remember that the Gas Regulation Act had not been passed; and they were all very much in the dark as to what was going to happen. He (the speaker) had ventured to suggest at the meeting that there were two important points with regard to the gas of the future which they should all keep in view. He felt sure from what Mr. Madden had now said in his paper that he had not altered his opinion in this respect; and he (Mr. Canning) could assure them he (the speaker) had not altered his. The two important points he thought were flame temperature, without which they could not get the efficiency, either in lighting or in gas-fire heating, which was so necessary for the success of the gas industry; and, secondly, he still believed firmly that inert constituents should be kept at as low a figure as possible. Indeed, he felt that this last point was so important that there was no need whatever for Parliament to put any restrictions on the gas industry in this respect, because for their own sake they would be obliged to keep the inerts down. Mr. Madden had mentioned his (the speaker's) name in connection with waste heat. He was sure that he had not investigated the matter to anything like the extent that Mr. Madden had; but he was very anxious some time ago to see whether it would be possible to raise steam from the waste heat of horizontal settings. On testing the temperature of the waste gases by means of a pyrometer, he discovered, to his astonishment, that there was not sufficient waste heat to be worth recovery. With vertical settings, working under different conditions, the waste gases passed away at a higher temperature; and undoubtedly the application of waste-heat boilers to them was a great advantage, as it was also in the case of a water-gas plant. But he would go further than this, and would say that in many cases it would pay an undertaking to waste a little heat from its settings in order to be able to raise all the steam necessary for the works. He was convinced of this, especially in these days of high labour and capital charges. He had used the word "waste" in this respect, though he did not look upon it as waste, but as a more efficient method of utilizing one's fuel. The same fuel practically was consumed in the furnaces—at any rate, very little more would be required—and the same labour would be able to deal with it. They got rid of boiler-house, chimney-stack, and other expensive things; and he felt that in such a case one was quite justified in allowing a little extra waste heat to pass into the flues, providing it was intercepted again by means of a waste-heat boiler. He agreed absolutely with Mr. Madden's remarks respecting mains and services. It was essential that they should give consumers a good supply of gas at a good pressure; and his own experience had been that, unless this was done, the consumers would never be satisfied. Practically every complaint one got as to supposed deficiency in the quality of gas was really due to an insufficient supply. Then, of course, their distribution systems had suffered very much during the war. They had not been able to give them the amount of attention which they should have done; and he was sure that a generous expenditure upon putting this portion of an undertaking into thoroughly good working order would prove an admirable investment at the present time. He would like particularly to support Mr. Madden's remarks as to the education of the juniors in all branches of the industry, and the formation of a Junior Gas Association for the district. They might as well face this matter frankly. If their competitors were able to secure better brains than they themselves were, then the gas people might as well go out of business altogether. They must have young men coming forward in the industry who were not only willing and anxious to qualify themselves, but who really loved the work. He always felt that this was the first consideration—that a man should love his work. Then, in the second place—and here he was sure he was echoing the views of a great many in the industry—the properly qualified man should be adequately paid. There was not the slightest doubt about this. He knew that the bulk of gas undertakings at the present time recognized the value of a good man, and paid him sufficiently; but, on the other hand, he was afraid in many cases there was rather a tendency to take the man they could get at the lowest figure. A contented man was a good investment; and with the financial anxieties following upon under-payment, a man's efficiency was bound to suffer.

Mr. EVAN REES (Margam) said they had listened to a paper which would prove of great value to them. It covered the widest range, and indicated certain new lines upon which they would have to travel. In the first place, South Wales coals had always been a problem with them. On looking up the discussion upon Mr. Madden's notes of June, 1920, he observed that one of his colleagues said that their North country friends were even sometimes surprised to hear the complaints as to the character of South Wales coals, and were somewhat sceptical. Nevertheless, it was a fact that South Wales coals, and Midland and North country coals, had a large gap between them, as far as their utility for gas manufacture was concerned. Mr. Madden had taken them along the road they would have to travel, and had indicated clearly that conditions had changed, and were changing, and would continue to change. It appeared to him that the key-note of the paper was heat conservation, with consequent coal conservation. Coal conservation was truly their object, because they were the industry that was in a position to act as the greatest conservators of the country's biggest asset of national value. The author had touched upon the necessity for skilled assistants; and Mr. Canning had pointed out that works were not all sufficiently large to be able to take advantage of such assistance. Nevertheless, the lines had been indicated upon which, though they might be small in comparison with undertakings of the first and second magnitude, they should follow. They had received sufficient impetus to proceed in the direction set forth in the paper. Education was a most important matter, because there could be no progress at all without it; and, as Mr. Canning had said, if their competitor could capture the best brains that were available, the gas industry might as well go out of business. The opposition, however, ought not to be in a position to secure the best brains; and it should be the business of every gas undertaking to contribute out of their funds something towards furthering the educational side. He had no doubt at all that this could be done. On the other hand, those connected with the industry as juniors must help themselves; but they must be given something to aim at. A pleasing note in the paper was the very human way in which Mr. Madden referred to the human element. There could be no doubt that the better the conditions under which men were employed, the better would be the service rendered by them. Under the best conditions, a man would give of his best; and it was necessary to produce good conditions in order to produce good results. As he had said, all would derive great advantage from a study of the paper.

Mr. W. C. JACKSON (Neath) said, with reference to the coal comparisons, most of them had from time to time carried out extensive tests to ascertain which were the most suitable coals for their own purpose; and he had no doubt that, if these could be collated and distributed, it would be of very great benefit to all of them. His own work in endeavouring to discover the most suitable coal for use in vertical retorts would have been very much simplified had there been such a source to tap, whereby he could have avoided some of the troubles he had met with through working with coals the resultant coke from which hung on from morning till night, until at last he arrived at the coals which were now giving admirable results. As to thermal efficiency, they were all working at this; and it was essential that they should do so. They must see that the highest possible thermal efficiency was obtained. In connection with this, he thought when he put down his vertical retorts that it would be a good plan to instal a waste-heat boiler; and he persuaded his Committee to do it. There had not yet been an opportunity of testing the boiler, except for a run of one day, when they found that it promised to come up to expectations. Eventually he hoped they would be in a position to close-down the whole of their other boiler plant, and run the entire works from the waste boiler, with steam generated from heat which would in the ordinary way be going up the chimney, at the same time bringing about a saving in labour. It was upon details that they really depended for their efficiencies. As one of his old chiefs used to say, it was small things one had to look after; big things hit one in the face. With regard to his own vertical retorts started this year, he had laid it down that they must have regular analyses, &c., with the result that they were reaching a very high state of efficiency. Distribution problems at the present time were making things somewhat hard in many cases, where districts were served with small mains. This was going to be a big question for some years to come. He thought the classes which had been started in Cardiff should be supported as widely as possible, and trusted that within another twelve months there would be similar classes held in Swansea. He would also like to back-up what Mr. Madden had said with regard to the juniors. He remembered that in his early days a Junior Gas Association had been of the very greatest

help to him. Questions were discussed there which were never heard of at the senior meetings. With reference to the human side, there was no doubt that the vertical retort system had produced conditions under which workmen had an easier and more healthy time; and the possibility of bettering the men's conditions was a matter which should always be taken into account by a manager.

Mr. J. STEPHENSON said he hoped that the question of informal meetings would be seriously taken up. Their Institution met very seldom; and he would like to suggest that the Council or the Special Purposes Committee should take the matter up, and arrange for such meetings.

Mr. MADDEN, in reply, said he was still a believer that their industry was the greatest conservator of coal that was to be found; and with this belief in front of them, they could go forward determined to produce a good commodity which could be sold at a cheap rate. It had been said that it would not pay on a small works to have technical assistants; but let them work it out. Work out what it would mean if they could get 200 c.ft. more gas per ton of coal carbonized, or (as they should speak of things now) another 3 or 4 therms. Furthermore, what would it mean if in connection with their furnaces they secured another hundredweight of coke per ton for sale? He could stop there; but other things would occur to them. Put it all down on a piece of paper, and total it up, and place on the other side the salary of a technical assistant who gave his whole time to the work. It would be found that it was a commercial proposition which would more than pay for itself. There would be something to carry forward after they had paid the salary and met the cost of the instruments. Take furnaces, here was a case in point. In the matter of the clinkering of furnaces, look what had been done by investigation during the last few years. He remembered the time when they put spear-bars into their furnaces every eight hours; but they placed a technical man in charge, and watched and tested until they got at the real condition of affairs. The clinker was running-up into the furnace, and therefore the spear-bars had to go in. Instead of having a slight pressure in the combustion arch, they had a very small vacuum. Directly this fact was ascertained—and it was only after a lot of investigation—they put a very slight pressure on the furnace. The clinker then went down, and they could dispense with spear-bars. These same furnaces had now to be clinkered only once every eight months. They were only pricked-up. With the slightest pressure in the top of the furnace, even with the dirtiest coals the clinker would run down. This investigation paid for itself. Then in pricking they went a step further. They found combustible material coming out with the ashes; and this was worked at. With a slight alteration (ascertained by investigation), they had ten bogie loads of ashes less in one day from one of their retort-houses. This was a big item. He congratulated Mr. Jackson on having the first waste-heat boiler in operation in South Wales. He hoped there would soon be many more of them. The question of flame temperature had been in his mind, though he did not mention it. Flame temperature was a most important thing to watch. Taking it from the gas-engine efficiency point of view, it was flame temperature that this chiefly depended upon. If they wanted to examine this for themselves, those who had a water-gas plant could connect-up some fires and mantles, and put their 330 or 340 B.Th.U. water gas through, and see what happened. They would be surprised at the heat efficiency of the fires. Why? Because of the high-flame temperature of the carbon monoxide. The question of informal meetings was one which he hoped the Council would before long take into consideration.

The PRESIDENT, referring to the matter of clinkering, said he had introduced exhaust steam from their engine, not only to the furnace-bars under the horizontal settings, but also under the boiler; and Mr. Madden would be surprised to know that they had scarcely a clinker. Of course, steam had been tried at various times; but it did not appear to have effected the results anticipated. It seemed that the jerk of the steam going in must have something to do with it. The stokers simply had to give the bars a tap-up.

"SIMPLEX" CARBURETTED WATER-GAS PLANT.

By E. LINSLEY.

Until recently, a water-gas plant to work in conjunction with coal-gas retorts was a proposition only to be thought of by the larger gas undertakings—partly because no unit small enough was available, partly on account of the skilled supervision required, but principally because in medium and small works the cost was prohibitive.

In 1918, Mr. J. W. Gibson, of Budleigh Salterton, was attracted by an article in the Technical Press which suggested a plant on the converted producer principle; but after a trial this method had to be abandoned. The experience gained, however, suggested further experiments, the result of which was the "Simplex" plant,* patented and brought into operation in 1919.

This plant consists of a rectangular generator built entirely of firebrick, braced together with angle-irons and tie-rods—no casing being required. The producer has a capacity of about one ton of coke; and the sectional area in relation to the depth and the position of the off-take were matters which had special attention. The off-take is in the form of an ascension pipe with arch and dip-pipes coupling to a hydraulic main, which provides a simple method of arranging the stack and gas valves. The former is a heavy steel plate, bedding on to a thick asbestos seat on top of the ascension pipe, and the latter a cone-valve fitting the turned and chamfered end of the dip-pipe. On the off-take of the hydraulic main a seal-regulating valve is arranged, by means of which a level gauge may be maintained in the generator, regardless of the pull on the foul main. A Sturtevant high-pressure fan supplies the blast, at a pressure of 14 in. Any pressure of steam from about 30 lbs. to 80 lbs. is satisfactory; a superheater being arranged in the brickwork of the generator.

The operation of the plant is extremely simple; all the valves being connected to a shaft conveniently placed in front of the producer, and worked by a single hand-lever. Levers connect from this shaft to all the valves. The gas-valve on the dip-pipe and the steam-valve automatically close when the air-blast and stack-valve are opened for the blow. On the position of the lever being reversed for the make, the blast and stack valves automatically close, and the gas and steam valves open. The blow occupies five minutes, and the make ten to fifteen minutes, so that the operator has only to move a lever about six times an hour for continuous gas-making.

The plant may be erected entirely above the ground level or in a subway; a convenient position being at the end of the existing bench of retorts, and the subway extended to suit. At Budleigh Salterton, and also in a recent installation, the top of the generator is kept level with the floor-line; and this is the ideal position for convenience in charging with coke. It also brings all the valves and connections within easy reach of the operator.

The carburetting is by tar only—no oil being required. The carburettor consists of a small cylinder without any filling, the gas entering at the bottom end. The tar is blown-in at the top by superheated steam in the form of spray from the atomizer. The ascending hot gases, picking-up the lighter oils, pass to the foul main; and the residue is taken off to a seal-pot in the form of dehydrated tar.

The original plant was fitted with an ordinary grate; and this was altered later to the step-grate. A further improvement was tried last year, when the "Sydenham" grate was introduced. This was found to give such satisfactory results that it has now been adopted for all plants. For the first time in water-gas plants the clinker trouble has been eliminated, even when coke from an inferior grade of coal is used. The fire only requires pricking-up at intervals of two to four hours; and the ash is taken out. No false bars are required. The fire-bars only require renewing at long intervals; and they can be replaced at any time without disturbing the fire.

The plant at Chepstow is substantially as described, and has a capacity of 75,000 c.ft. per day. The generator is 5 ft. by 2 ft. inside, and the over-all height 12 ft. The subway is 8 ft. deep; so that the generator brickwork is 4 ft. above the ground-level.

A test of the blue gas was made at Budleigh Salterton in May, 1920, the analysis being as follows:

	Per Cent.
Carbon dioxide	4·9
Oxygen	0·2
Hydrocarbons, unsaturated	0·4
Carbon monoxide	48·0
Methane	7·5
Hydrogen	33·7
Nitrogen	5·3

It gave a calorific value of 348 B.Th.U. The outstanding features are a high proportion of carbon monoxide compared with the hydrogen, the high proportion of methane, and the low proportion of nitrogen.

The results were confirmed by tests made at a works near London last May, the analysis of the blue gas (giving a calorific value of 336 B.Th.U.) being as follows:

	Per Cent.
Carbon dioxide	5·8
Oxygen	1·6
Carbon monoxide	36·4
Methane	7·3
Hydrogen	45·3
Nitrogen	3·6

A three days' test was carried out at the same time, when the plant was worked for sixteen hours and shut-down for eight hours during the night; the results being:

Coal carbonized	81·0 cwt.
Coke used	12·0 cwt.
Gas made	83,300 c.ft.
Coal gas (at 12,000 c.ft. per ton)	48,600 c.ft.
Water gas (difference)	34,700 c.ft.
Percentage of water gas	41·6
Water gas per ton of coke	53,800 c.ft.
Tar used	60 gallons.

At Chepstow the plant is working into a relief holder for the first time; and it is hoped to obtain figures which up to now have not been available, as all previous plants have been direct-coupled to the foul main. No doubt there are advantages in working this way, as a more thorough mixture is obtained, and the rich hydrocarbons, which would otherwise be thrown down in the coal tar, are absorbed by the dry and hot gases from the water-gas plant.

The main features of the plant, beyond its simplicity and suitability for smaller works, are the absence of any skilled labour, the stokers usually working the plant—no extra men being required; clinkering is done away with; the plant may be worked intermittently for periods during the day and shut-down at night (giving economical and flexible working); further units may be added as required, making the plant suitable for any size works, and each of the units worked separately or together.

Plants are now working at Budleigh Salterton, Silsden, Havant, Elstree, Louth, Newmarket, Woolton, and are in hand for Atherstone, Launceston, Newport (Fife), Huntingdon, and North Palmerston, New Zealand.

* See "JOURNAL," Vol. CXLVIII., p. 543; also Vol. CLIII., p. 543.

The installation at Havant (set to work in December, 1920) is a twin generator built in an empty arch. At Elstree, Huntingdon, and Launceston the plants are above ground; and at Budleigh Salterton and Atherstone they are entirely below the ground. The remainder are in subways from 6 ft. to 8 ft. deep.

Before closing may I give extracts from one or two unsolicited letters received regarding the working of the different plants.

1. "I am now working the 'Simplex' two shifts out of the three, and introducing 17 to 18 p.ct. of water gas with the coal gas, and maintaining our usual quality of gas and getting no complaints. The make per ton of coal carbonized is 14,000 to 15,000 c.ft., compared with 11,000 c.ft. per ton before the plant was started. The 'Sydenham' grate is quite a success. We prick-up every four hours."

2. "The plant continues to make 3000 c.ft. per hour; and we work eight hours per day—seven to three o'clock."

3. "I have restarted the 'Simplex' plant to-day; and, despite having been at work only a few hours, the advantage is already being proved, as the make has gone up from 3000 to 5000 c.ft. per hour with the same number of retorts at work. The plant was shut-down for the boiler inspection; and I was more than surprised to find the generator in such good order. The wear and tear after nine months was very slight."

4. "I was interested in the results you sent, which resemble ours. During the last four days, the make per ton was 20,800, 21,600, 22,500, and 23,300 c.ft.; and we have had to shut-down, as both holders were full. The stokers have only been charging eight to twelve retorts per shift, and working the water-gas plant. We are getting big makes per man with a very low consumption of coal. The stokers are most interested in the work, as it is easier than drawing and charging. We have only one bed working, and the saving of coke for heating the retorts alone will go a long way towards feeding the water-gas plant."

Combustion of Carbon Monoxide at High Pressures.

Under the auspices of the Royal College of Science Chemical Society, Prof. W. A. Bone, F.R.S., will deliver on Friday, Nov. 11, a lecture on "The Late W. A. Haward's Experiments upon the Combustion of Hydrogen Carbon-Monoxide at High Pressures." The lecture is intended as a memorial to the name and work of the investigator; for it was this research which led to the accident which cost him his life. The meeting will be held in the Main Chemistry Lecture Theatre, Royal College of Science; and Sir Alfred Keogh, G.C.B., Rector of the Imperial College, will take the chair at five o'clock.

Thermal Efficiency of an Oil-Gas Set.

In a long paper contributed by Messrs. E. L. Hall and S. H. Graf to the recent Pacific Coast Gas Association Convention, there is described in detail a study which has been conducted on the thermal efficiency and complete heat-balance of an oil-gas set, based on operating records and special tests made at the works of the Portland (Ore.) Gas and Coke Company. The input for such an oil-gas set includes making oil-steam, heating-oil, and air. The output consists of purified gas, lamp-black (which is briquetted), and tar. The over-all thermal efficiency is found to be 72·07 p.ct. Individual losses are segregated and analyzed in the paper. The largest of these losses, in order of magnitude, are found to be the following: Heat in carbon deposited and unburned, 9·48 p.ct.; heat lost in wash-box, 7·59 p.ct.; heat lost in stack gases, 7·24 p.ct.; heat lost in radiation and convection, 1·38 p.ct. Possibilities for the reduction or utilization of heat lost are discussed. These include a consideration of waste-heat boilers, regenerative heating of blast air, reduction of steam used, more perfect heat insulation, and certain changes in operation and length of cycle. The total possible saving is estimated at 12·13 p.ct., making the possible thermal efficiency 84·20 p.ct., or better than that of the best steam-boiler practice. The authors discuss various aspects of thermal *v.* economic efficiency; and it is pointed out that the two are not necessarily the same.

Gas-Works Waste Heat for Baths.—Writing in "Gas und Wasserfach," Dr. Paul states that the Leipzig Gas-Works have for some considerable time been using the heat in the water of the scrubbing plant for preheating the water for the municipal baths, some 300 yards away. The water leaves the scrubber at a temperature of about 70° C.; but it cannot be used direct for bathing, and is conducted through two preheaters, which were formerly supplied with the exhaust steam from the engines of the electricity works.

Fusain in Coal Dust.—Lecturing on fusain to the Manchester Geological and Mining Society, Mr. F. S. Sinnatt said that no experiments appeared to be available as to the relative explosive properties of fusain dust and coal dust in air; but in view of the fact that this property of dust was frequently associated with the percentage of volatile matter in the material, and considering that dust containing fusain contained a lower percentage of volatile matter than the corresponding coal dust, it would follow that the presence of fusain in coal dust would render it less explosive than ordinary coal dust. On this assumption, the presence of fusain tended to make the mine dust less dangerous.

RATE OF CARBONIZATION OF COAL.

By Dr. GEOFFREY WEYMAN.

At a Meeting of the Newcastle Section of the Society of Chemical Industry on Tuesday, Oct. 25—Dr. J. T. Dunn presiding—Dr. GEOFFREY WEYMAN read a paper entitled "The Rate of Carbonization of Coal."

Dr. WEYMAN said his paper was an account of various results obtained by observing the rate of gas yield when a known amount of coal was placed in a steel tube and plunged in a certain quantity of heat contained by molten copper in a calorimeter. The influence of the size of the coal particles he showed in a series of plotted curves. Taking all the grades of coal used, he found that the curves were very regular, indicating that, although the carbonization was rapid, the penetration of heat was even. Not only did the smaller grades give a very slow rate, but the rate reached a maximum rapidly and tailed-off quickly. As the size increased, the rate of the gas evolution increased; the exception being that the size 3/4 came considerably lower than the size 4/8. Another feature of the behaviour of the larger grades was that the maximum rate was reached at a later date. The maximum yield for the smaller size was reached nearly a minute in advance of the larger size—due mainly to the sharp rise in the first half-minute. On the other hand, the smaller size, after reaching the maximum gas yield, died-away much more slowly.

The results of many experiments upon mixtures made up by the addition of small amounts of one grade to large amounts of another grade showed that the rate of carbonization was only slightly different from that of the large grade by itself; but the curve was somewhat nearer to that of the grade making up the smaller proportion.

Generally speaking, mixtures of two sizes gave results approximating to the mean of the components, unless the sizes were widely separated; and it might be imagined that mixtures containing all intermediate sizes would approximate to the mean size. This, however, was not the case. The rate for mixtures containing all sizes depended very largely on the difference between the maximum and minimum sizes. The highest rates were obtained when the mixture contained large particles as well as small—*i.e.*, when the mixture was irregular. A very slight variation in the amount of any one grade—particularly in the smaller—made a very large difference in the rate, which was not found to be the case with mixtures of two component sizes.

Dr. Weyman said that his practical observation had proved that a retort charged with English coal in pieces 1 c.c. in size distilled the same weight in three hours as other retorts in the set-still distilled in four. When dust was mixed with nuts, the distillation was only slightly retarded. Large pieces and heaped-up dust, however, produced disastrous results.

He considered, when dealing with the carbonization, that it was the size of the interspaces rather than the total free space which was important. Thus, an ungraded coal contained, as a rule, less free space than any of the grades resulting from screening; yet it would often give a more rapid rate. The question of size was, naturally, of more interest to the gas industry than to the coke industry. In the case of coke-oven plants rapidity of carbonization was sacrificed to the production of an even texture and distribution of the ash, and the penetration of heat was mainly by conduction. It was found, in this regard, that it was coking coals in particular which, by giving a thin but viscous layer, were most liable to be blown into a frothy mass under rapid carbonization.

One of the greatest difficulties of rapid carbonization in continuous vertical plants occurred when the coal in use was liable to swelling. The swelling was accentuated by the rapid heating, and led to the hanging-up of the charges and to porous coke. Mr. R. Illingworth had shown that the swelling was the result of the decomposition of the B cellulosic constituents of the coal at the same time as that of the resinic constituents of the coal; the gas evolved from the former forcing the residue from the latter into an expanded form. In coking coal the cellulosic compounds were much less stable than the resinic; while in gas coals the relative stability was of the same order. It followed that rapid carbonization would bring the decomposition points of the two classes of constituents closer together in the case of coking coals than with gas coals. This seemed to be borne out in the author's experiments, as coking coals invariably gave poor rates.

Dr. Weyman's conclusions, particularly regarding carbonization carried out at high rates, were summed up as follows:

(1) The transference of heat to the interior of the charge is most rapidly affected by the gases evolved. Conduction is relatively slow, and radiation still slower.

(2) The transference of heat by gases is practically stopped by the formation of the impervious plastic layer which forms when coals that give adherent coke are heated.

(3) The size of particle is most important as interfering with the formation and continuity of this plastic layer. The larger the size of particle, the less continuous the plastic layer, and the more rapid is the carbonization.

(4) The increase of rate due to increase of size is limited by the necessity for a preliminary heating of a small layer of coal by conduction, as radiation is ineffective. This preliminary heating can only be effected by contact of coal with a heating surface,

and it necessitates a small size of particle in comparison with the diameter of the retort.

(5) Thus there is a critical size corresponding to a maximum rate for each coal; the diameter of the retort being fixed.

(6) With coal containing all sizes, the rate depends very largely on the difference between the maximum and minimum size—the more irregular the mixture, the better the result. Relatively small amounts of dust affect the rate very adversely; more so when the coal possesses an even graduation in size.

(7) The result of mixing different coals is, generally speaking, to give a mean of the rate of component coal; but this can only be foretold by an examination of the particular coals, having regard not only to the constituents of the coal substance, but also to the size of the coal particles mixed.

(8) For any size, the following classes of coal are arranged in ascending order of maximum rate of carbonization—there being a gradual transition from class to class: Coking coals, gas coals, cannels, anthracite, and non-coking coals.

DISCUSSION.

Dr. W. B. DAVIDSON said that the paper would well repay close study. The conclusions Dr. Weyman had come to—that the heat transference in carbonization was due in the greatest measure to the gases generated passing through the bulk of the coal—was strikingly verified by the process of low-temperature carbonization, where the heating was entirely internal, and carried out by means of highly superheated steam. There the rate of carbonization was remarkably high. Many years ago, when he had charge of a coal-testing plant carbonizing 20 or 30 tons per day, one of the tests was to make Coalite. It was surprising to find how slow was the rate of carbonization. Though the temperature was only 1200° Fahr., it took about double the time with the same charge to carbonize as it did at a temperature of 1900° Fahr. This proved that Dr. Weyman was on the right track when he said that the travel of the gas had a most important influence on the rate of carbonization; but he would like the author to calculate, from the specific heat and the temperature of the gas at high temperature working, what was the approximate proportion of the effect by so working? He could not see that there would be sufficient heat in the gas generated to effect a very large proportion of the carbonization. Of course, with low temperatures it was quite different. One had then a large quantity of steam with higher specific heat than with crude gas, and the temperature required was much lower. No doubt Dr. Weyman's familiarity with the peculiarities of continuous vertical retorts had acted as a stimulus. Theoretically, the continuous vertical retort was an ideal process, as one could set the rate of the downward movement of the charge to a nicety. But, unfortunately, with certain coals, their plastic and sticky nature prevented the carbonizer from doing this at all times. In this connection he would like to state his opinion that the travel of gas in vertical retorts had also an effect (and a pernicious effect) on the quality of the gas. He did not know whether Dr. Weyman had observed that coke from vertical retorts was often coated with fluffy carbon. It was well known that the heavy hydrocarbons of the gas were degraded; the result being that the composition of the vertical retort gas was considerably lower in heavy hydrocarbons than the gas from horizontal retorts; while the hydrogen from vertical retorts was much higher. The gentlemen present who were not carbonizers might run away with the idea that all this applied closely to practical working; but, as a matter of fact, in practical working they paid no regard to the size of the coal—always working it off in the same time, and getting the same results no matter what the size used. Experiments carried out to try very small and very large coal had resulted in the same gas yields—that was, cubic feet and quality per ton, which showed that while there might have been a margin in one or another, there was complete carbonization in each case. In intermittent retort working, one did not think of varying the duration of the charge. It was only in the vertical retort process that one could resort to this method. On behalf of carbonizers he desired to thank Dr. Weyman for his valuable work.

Dr. LISHMAN wished to add his congratulations to the author of the paper, but did not feel inclined to comment on the subject matter without more consideration. It was a most valuable contribution to an important subject.

Prof. J. W. COBB, in a contribution to the discussion, said that the paper, as a study of one of the factors that must have considerable influence in determining the behaviour of coal on carbonization and gasification, was both interesting and useful. It had been known in a general way that the state of mechanical subdivision was not to be ignored in considering the probable behaviour of coal either in a retort or a gas producer, but more precise information was lacking. There was an obvious danger in applying the laboratory results to large-scale practice in such a matter as this, without due consideration of the differences necessarily involved. But no doubt Dr. Weyman had this in mind, and was only concerned for the present with establishing certain principles. It was interesting to note the important part played by the actual transference of heat by the gases present, even when retort practice alone was considered. It constituted a definite point of superiority for the processes depending on internal heating, where the heating was deliberately effected, not by transmission through the walls of a retort or oven, but by direct penetration of a hot current of gas. It also suggested the advantage in any process of gasification of being able, if necessary, to disturb the particles of coal which were being gasified, as could be done by poking in the gas producer, and to a less extent in a continuous vertical retort. The disadvantages of dust in a charge for most purposes were well brought out in the paper; and this really, in practice, should be coupled-up with a consideration of the inert matter, for the simple reason that even in a coal low in ash the dust portion might consist so largely of inert substance.

Mr. H. DUNFORD SMITH, in thanking Dr. Weyman for his paper, remarked that he had been struck by the point that there was such a similarity in the volatile matter of coals with such wide differences in the ash. It seemed inexplicable, but he could confirm it from his own experience as an analyst. Whether or not it was worth following up he could not say, but it seemed to him a most remarkable thing.

Prof. LOUIS wished to ask Dr. Weyman whether he had produced his different sizes of coal by taking a parcel of coal, breaking it down, and then sifting off the different sizes. If he did this, he would certainly get a bigger proportion of inorganic matter in the finest, whereas if he took a parcel of coal and divided it up to begin with, and then crushed each down to the required size (provided the work was done accurately), he ought to have got a more uniform composition throughout. He would be interested to know whether the finest coals did or did not contain a larger proportion of ash than the coarser portion.

Mr. F. H. WALKER asked what method was used in determining the volatile matter, and what sort of burner was employed—a bunsen or a Méker. He suggested that the sort of burner used might affect the volatile matter.

Mr. F. COOKE said that in his experience at one place it was always the custom, after the ovens had been let-down for any time, to use washed coal as a method of heating-up the battery. He would like to know the rate of temperature during the different distillations. In intermittent verticals, for instance, it had been observed that in many cases there was a rise of between 300° and 400°, and then there was a gradual fall to a maintained temperature of about 280°.

Dr. WEYMAN, replying to the discussion, said that with regard to the carrying of heat by the gas which Dr. Davidson referred to, he believed there was a practical point raised in the discussion in the Fuel Research Inquiry. They found that on the application of steam to a retort there was less heat required in the combustion chambers. It was very difficult to say offhand whether it was so or not. It suggested itself to him at the time that the application of heat was really due to the fact that the gas and steam were carrying heat from the hot coke at the bottom through the charge, which would account for the fact that they could do with lower temperatures in the combustion flue. He had not calculated the amount of heat which could be carried. It was a complex calculation; and it was doubtful whether they could arrive at a reliable figure. Of course, in vertical retorts, there was a great controversy as to the travel of the gas; and originally it was thought that the gas went up through the middle. The general opinion now seemed to be that the greater part of the gas went up through the coke, and only a comparatively small portion through the centre of the raw coal charge. This was due to the existence of the plastic layer; and by the breaking-down of the layer one encouraged the gas to go through the centre. This was why they found, in practice, that they got greater calorific values and a better yield of gas when the rate of carbonization was increased. It was a rather curious thing that they had found when doing so that when one of the lighter coals—a true gas coal—passed through the vertical retort the rate of gas output substantially increased and the calorific value and the gas multiple were very much increased. He was pleased to find the confirmation of his experience in the remarks of Mr. Cooke. He assured them the work had really been done, because they found they could put certain coals through 25 p.ct. faster than others, and they wanted to know the reason why. The reason seemed to him to be based entirely on the properties and composition of the plastic layer. Also, it was fairly generally known (though he could not quote figures) that if they carbonized nuts they got a more increased output than if they carbonized smalls. The point Mr. Smith had raised, regarding volatile matter, was interesting though he could throw no more light upon it, except to say that Sinnatt wrote a "Bulletin" on the subject, and gave certain figures. With regard to Prof. Louis' question on screening, he had tried all sorts of methods, but none gave really reliable results. The breaking-down of two or three lumps, and taking a portion of each for screening, gave the best results; but they were not exact. The lumps themselves were not identical; and it was very difficult to get them really concordant. With regard to Mr. Walker's question, the Méker burner was used. He did not think it would influence the question excepting if someone else was using a different burner in the course of the work. It was all done with the same burner by the American method of seven minutes. He had no figures of temperature gradients as the tube was too small; but a rough calculation was that the temperature rose to over 750° within ten minutes; but it was probably considerably higher when measured, as he had to disconnect the tube to get the pyrometer in, and there was the interval before the pyrometer registered. He did not want anyone to get the idea that the sizes he had used would apply in an identical way with a large retort. This did not necessarily follow, as there was no doubt that the size would have some relation to the distance of the heating surface from the centre of the charge. This meant that though there was a relationship, he could not state it. It was a question of working it out on a large scale.

Price of Gas in Leeds.—The price of gas in Leeds remains at 5s. 3d. per 1000 c.ft.; and it is understood to be unlikely there will be an early reduction, for there can be no prospect of this until the losses consequent upon maintaining a supply during the coal strike are wiped-out. The Leeds Gas Department lost £60,000 during the coal strike, when as much as £5 per ton was paid for Canadian, French, and German coal. The Gas Department also lost £30,000 by the fall in the price of tar, and £20,000 by the closing of the Continental market for sulphate of ammonia.

Large Consumers at Coventry.—Mr. Kendrick moved, at a meeting of the Coventry City Council, a recommendation by the Gas Committee that the scale of charges to consumers of 1½ million c.ft. and upwards should be slightly reduced from the December meter readings. In doing so, he explained that this would mean a loss in revenue on the first year of £34,296; but if the reduced prices were not offered, there would be the possibility of producer gas plants being installed by large consumers for power purposes, and it would be certain that the gas undertaking would lose at least 25 p.ct. of its sales of gas, with a consequent loss in revenue of £53,000 per annum, to be made up eventually by the remaining consumers. It was in the interests of the industrial life of the city to sell gas in large quantities. The recommendation was carried.

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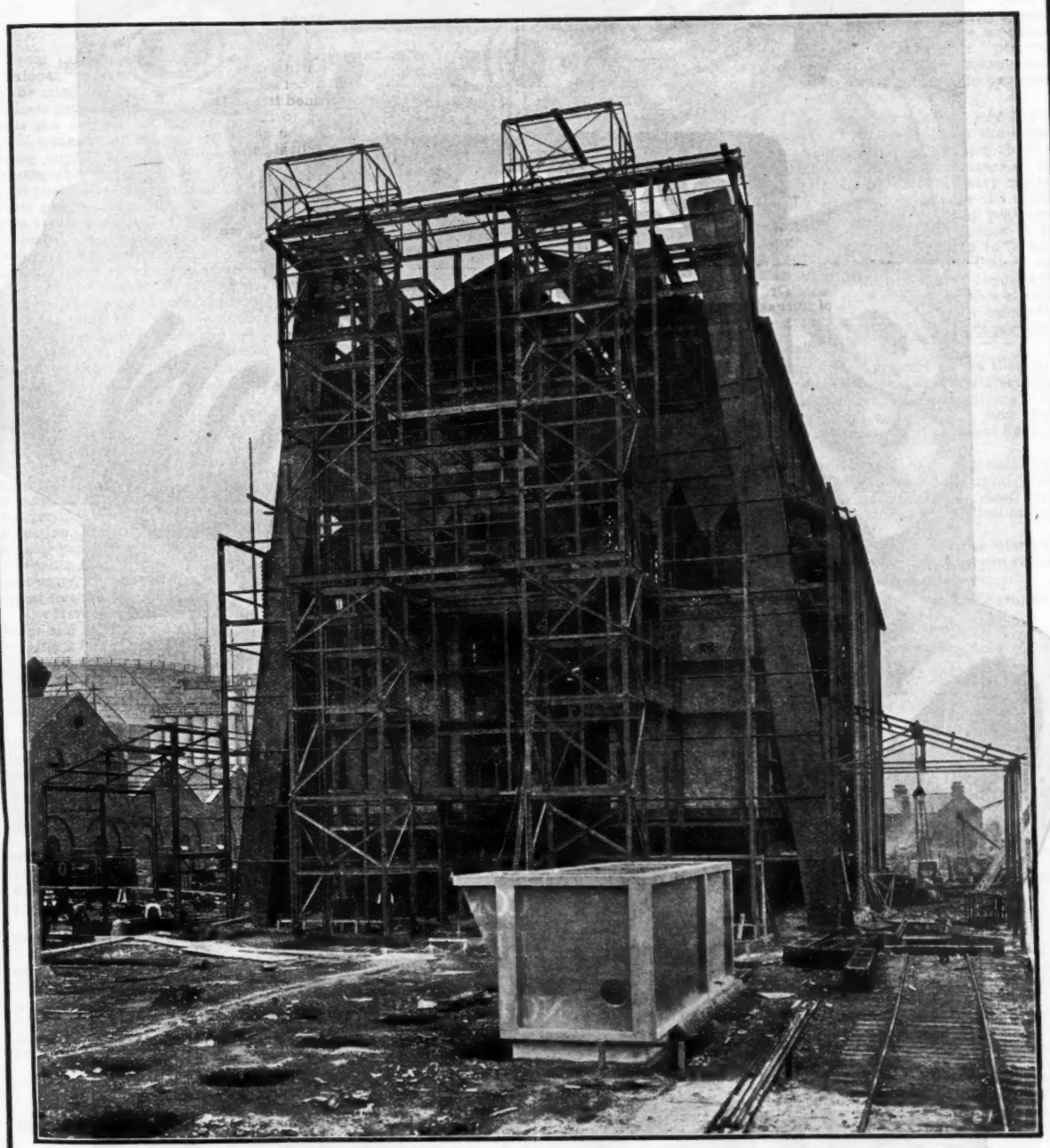

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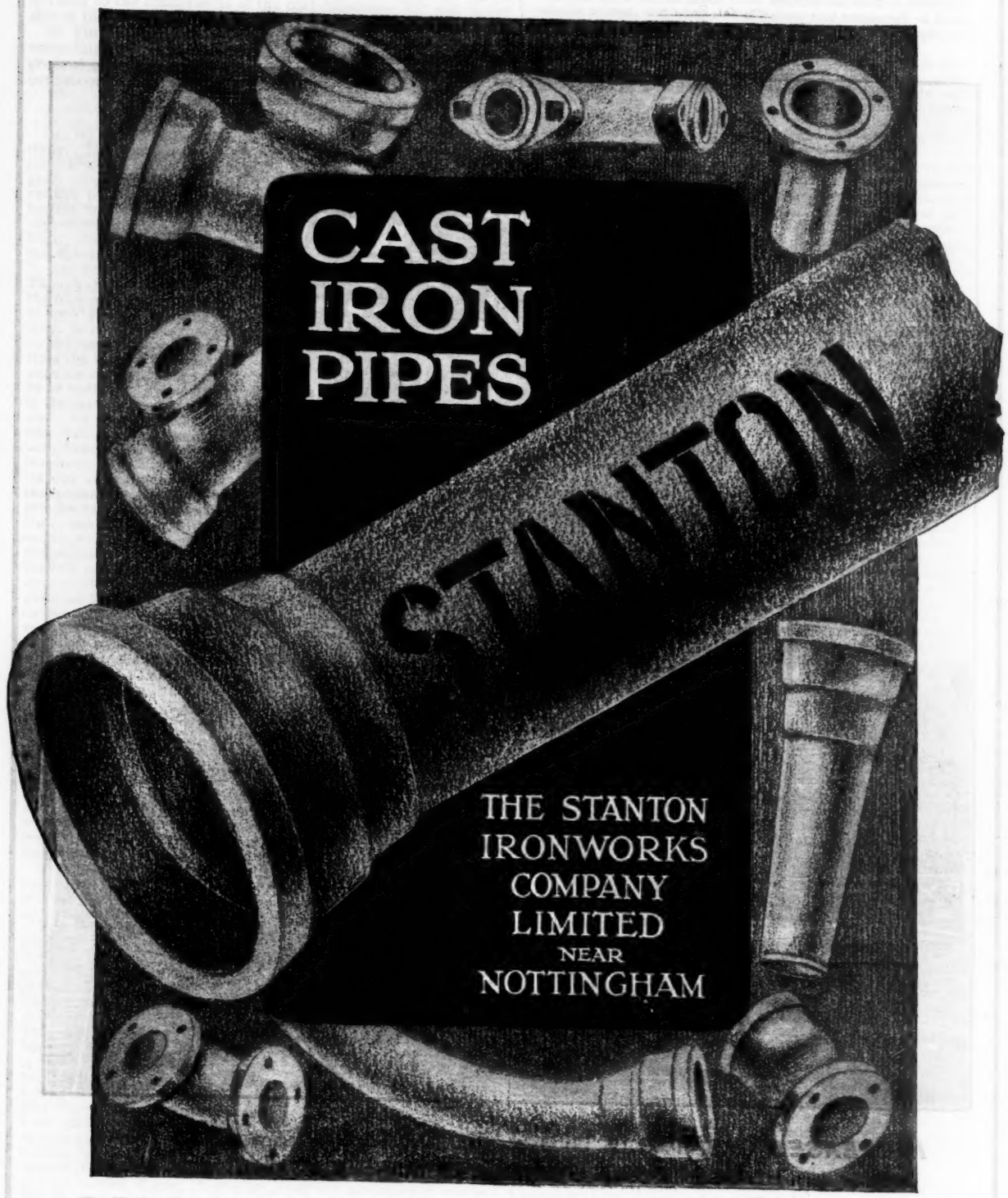
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Benzole Production.

SIR,—I am enclosing you copy of a letter, which was forwarded to the "Motor," answering numerous inquiries that have appeared in their Press as to "Where is the Benzole?" and as this morning I have received a similar inquiry, mentioning our advertisement in your paper, I thought it would be of interest to you to publish this letter.

NATIONAL BENZOLE COMPANY, LTD.
P. G. Somerville, Asst. General Manager,
National Benzole Company, Ltd.

30, *Grosvenor Gardens, S.W.* 1, *Oct.* 29, 1921.

[ENCLOSURE.]

From the various letters which have appeared recently in the "Autocar," it is evident that a good deal of misapprehension exists in the minds of motorists with regard to supplies of motor benzole. Benzole producers and the National Benzole Association, which represents the majority of producers, are being blamed because of the small quantity of benzole now available. In order to remove the wrong impression which evidently exists, perhaps you will allow me to state what is the present position. For some months before the great coal strike the iron and steel works were on short production. Short production of iron and steel means short production of coke from the bye-product coke ovens. As the bye-product coke-ovens at present are practically the only source of supply of benzole in this country, it was inevitable that the production of benzole declined as the production of coke was reduced.

During the coal strike the coke-ovens were of necessity shut-down, as there was no fuel available to continue their working, even if coke had been saleable. This meant that the production of benzole for the time being entirely ceased; and it is therefore no mystery that motorists anxious to get supplies of benzole were disappointed all over the country. A certain quantity of American benzole was imported, as America, not being on strike, was still producing; but this did not greatly affect the position.

Now that the coal strike is over, and work has been resumed to a limited extent at the iron and steel works, coke-ovens are being gradually started-up, and benzole is once more being made, although in a much reduced quantity. As an illustration, the following figures summarize the position: Out of a total of 303 blast-furnaces working in August, 1920, forty-seven are now working; and of a total of 9500 bye-product coke-ovens, it is stated that fewer than 3000 are to-day in operation. This means that at the best not more than 25 p.ct. of the benzole producing works in this country are in operation; and it is inevitable that, until the iron and steel trade once more recovers its prosperity, supplies of benzole will be curtailed. Benzole producers regret this position just as much as motorists.

The National Benzole Association are doing everything possible to foster and increase the production of benzole in this country. Quite recently a large sum of money was voted from the funds of the Association for this purpose; and, in conjunction with the Leeds University, the Association have undertaken an extensive research programme to ascertain what are the possibilities in the direction of obtaining increased yields of benzole.

In the meantime, may I suggest that it is no good making vain appeals to the authorities or the Government, or to any other powers that be, to "bring pressure to bear," as has been suggested? No amount of pressure can alter the economic position, which is, at present at any rate, that the production of benzole in this country depends upon the prosperity of the iron and steel trade. This prosperity, unfortunately, does not at the moment exist.

With regard to price, there should be no misunderstanding. The retail price in cans is 2s. 11½d. per gallon for "National" benzole; and no motorist should pay more. Instances of overcharges by garages should be reported to the National Benzole Company, Ltd., who will promptly deal with all complaints.

With the present limited quantity available, it is obviously impossible to place substantial supplies all over the country; but the National Benzole Company, whose distributing organization is now very complete, are doing everything possible to meet the position. With trade once more normal, and benzole on full production, motorists may rest assured that "National" benzole will be available as heretofore, and everything possible will be done by the producers to increase the supplies and thus strengthen the position of this home-produced fuel.

P. G. SOMERVILLE, Secretary,
NATIONAL BENZOLE ASSOCIATION.

Orders Obtained under Section One of the Gas Regulation Act, 1920.

SIR,—With respect to the above matter introduced by the writer in your issue of Oct. 19, I would like to convey my thanks, through your columns, to Mr. Ibbs for so kindly referring me to the various articles in your publications of the 6th and 13th of October, 1920, and also to state that, previous to the appearance of the articles referred to, I had taken a deep interest in the subject mentioned. But at that period, as indicated in the last paragraph of Mr. Ibbs's article, matters were not quite clear until the Board of Trade had made a move to grant Orders under the new Act. Therefore it was impossible to arrive at a conclusive point on matters generally. Since then a good number of Orders have been issued, and no doubt will have received very careful consideration by gas officials and administrators who are responsible for the carrying out of the terms specified therein.

The question of declared calorific value and dividend, which I inquired about in your issue of the 19th inst., seems to me to be a subject that requires some elucidation. There does not appear to have been a definite official statement made up to the present upon the point I raised in your issue already mentioned. Personally, after reading and considering very carefully the Gas Regulation Act and many of the Orders issued in conjunction therewith under section 1, I cannot find any reason why any alteration should take place in the amount of dividend slide because the declared calorific value of gas is either above or below the quality of gas upon which the new standard price was ascertained.

The usual paragraph in the Orders issued under section 1 of the Act states as follows:

> "*Standard Price.*—After the declared date, the standard price in respect of gas supplied by the undertakers shall be ..... per therm."

It will no doubt be here noted that the quality of the gas to which the standard price refers is not specified. Therefore it appears definite to me that it matters not what quality you "declare"—the standard price quoted in your respective Order is fixed and stationary until it has been varied by a subsequent new Order under the Act. Also, in reference to the "dividend slide," which is likewise governed by a clause in the new Order issued by the Board of Trade, there are no official indications anywhere, so far as I can see, that the "slide" per one-fifth of a penny per therm is to increase or decrease in accordance with the declared calorific value of gas. The clause referred to generally reads as follows:

> "*Modification of Sliding Scale.*—Any provision of any Act or Order having the force of an Act by virtue of which the undertakers may increase or reduce the price charged by them above or below a standard price, subject to a reduction or increase in the dividend payable by the undertakers on their ordinary capital, shall have effect as respects any dividend declared by the undertakers after the declared date as if one-fifth of a penny per therm were substituted for each penny per 1000 c.ft. of increase or decrease of price, and as if the standard price referred to in such provisions were the standard price prescribed by this Order; and for the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four and four-fifths."

To put the subject into small compass, it appears to me that, irrespective of what quality of gas your standard price was ascertained upon when making application to the Board of Trade and the holding of the inquiry, the price fixed by the department and stated in your Order stands for any quality of gas you may declare, and does not fluctuate in any way whatever.

I suggest that the Board of Trade would have expressly mentioned full conditions in the Order issued if intended differently; also I contend the same rule applies to the question of dividend slide. Otherwise I suggest you would have all kinds of complications and peculiar rates in dividends to deal with.

I would like to hear what other readers think, or what interpretations have been arrived at in view of the guidance necessary in relation to the forthcoming declaration of dividends early next year.

Oct. 31, 1921. ENQUIRER.

Congdon Retort Stand-Pipe System.

SIR,—We have perused Mr. Congdon's letter in your last issue, and are a little surprised that he should not have fully explained that the Beckton installation which we carried out for the Company was from Mr. Congdon's own drawings and under his own instructions. We did not agree with some of the details; but Mr. Congdon being the inventor and therefore the authority, we obviously could not do other than abide by his decision.

In the installation we have in hand for the Vauxhall works of the South Metropolitan Gas Company, we have adopted all the methods suggested by Mr. Congdon—including cast-iron stand-pipes, instead of thin sheet-steel. Also we have introduced other improvements. We hope this installation will be in working order in the early spring of next year.

Westminster, Oct. 28, 1921. ALDRIDGE AND RANKEN.

Water Gas Research.

SIR,—In reply to Mr. Thomas Glover, calling attention to the article contributed by me to the "JOURNAL" of Oct. 19, I do not wish it to be understood that I condemn entirely the practice of "steaming" retorts, but only the excessive use of steam in the endeavour to make large volumes of water gas in the direction of total gasification in vertical retorts as built and operated at the present time. I cannot better define my attitude than by quoting from the article—viz., "It is now a recognized fact that steaming retorts is a wasteful method of manufacturing water gas, although a small amount of steam admitted to retorts has a beneficial effect on the working of the charge in other ways."

I am willing to admit that I came to that conclusion before reading the Fuel Research Board's report; but a casual examination of it did not dispose me to modify my opinion, although some alterations were made to the experimental plant to render it more suitable for the purpose of steaming. I will, however, take Mr. Glover's advice, and meanwhile may say that the most elaborate and detailed accounts of steaming retorts (apart from the Fuel Research report) are the German trials with intermittent verticals at Mariendorf * and the Uddingston trials with continuous verticals †, and both retorts show on analysis the production of an inferior quality of water gas, and a high fuel consumption (due chiefly to the low temperatures available), compared with a plant designed to provide proper water-gas conditions—*i.e.*, the quick replacement inside the retort chamber of the heat lost in water-gas production, so as to avoid heat transmission through a first-class non-conductor (the sides of the retort) and its slow percolation to the core of the charge.

That the vertical-retort makers themselves are not satisfied with their results when attempting a high production of water-gas, is

* "Transactions, Gas Institution," 1908. † "JOURNAL," June 8, 1920, p. 604.

clearly shown when at least one of them (a pioneer firm of world-wide activity) has applied for and been granted patent rights covering a variation in the type of their plant, providing for superimposing a vertical retort on a water-gas generator; and we read in a recent booklet of another firm (of equal reputation) of an installation "specially designed to obtain the highest possible results with steaming," as though they had found the need of an improvement on past results. Such occurrences are more eloquent than any words.

If developments proceed along these lines, the makers of water-gas plants will then have, in turn, to look to their laurels and bestir themselves, lest they wake-up one day to find themselves left behind in the attainment of the best results. Many gas-works now making water gas appear to be working their plants as though there was no radical difference between making water gas and carburetted water gas; and results of such working are appearing in authoritative reports on the process of water-gas production.

A. O. JONES.

Chelsea, S.W., Oct. 26, 1921.

Low-Temperature Carbonization at Barugh.

SIR,—I am "completely gasified" by the report in your current issue of Major Hamilton's speech. Possibly it is the reaction of the Institution week, or the after-effects of my "disembodiment" at the hands of the War Office. But, apparently, someone has struck a gold mine.

The Major enlarged on the fact that an unmarketable slack of about 13,500 B.Th.U. per pound (some slack!) can be obtained at 6s. to 7s. per ton, and after a little kindly treatment between collapsible plates and christening, without the aid of water (patented cooling chambers), it is then sold for £5 a ton. I ask you, Sir, to tell me frankly if this is not the worst attempt at "profiteering" which has been tried on this distressed and afflicted country? There may be mitigating circumstances, justifying this very high price, beyond the excellent qualities claimed for the fuel. For instance, it is quite clear that a large commercial plant consisting of numbers of small units may be very expensive to erect, run, or repair, and may require considerable labour. But surely this cannot justify a price inflated to 1000 to 1500 p.ct. on the price of the raw material.

I do not follow the Major's remarks about the flue temperature. It is stated that this is about 550° C. But the gas yield corresponds closely to a carbonizing temperature inside the retort of about 600° C., which is confirmed by the reduction in the volatile matter from 33 to 35 p.ct. to 8 to 10 p.ct. It seems to me that the flue temperatures would be somewhere about 1000° to 1200° C.; otherwise I am much afraid that the flow of heat will not oblige, but will take the opposite direction to the desired one.

I infer from the Major's remarks that he claims to have performed a national service in having produced a system for converting "in a practical and economical form a waste product into an article of high fuel value." But to my mind this can be done more effectively by supplying a healthy high-grade smokeless fuel to the hard-up millions of my fellow-beings in this country, at ordinary market prices, than by catering for a few plutocrats who can afford to pay fancy prices for their comfort.

P. SANDFORD.

8, *Phillimore Gardens, Kensington, Oct. 28, 1921.*

Gas-Mantles and Unemployment.

SIR,—The members of this Association have allocated a substantial sum of money for the purpose of issuing announcements in a number of daily papers, to call the attention of the public to the grave bearing on unemployment in this country of the importation of large quantities of foreign mantles.

Within quite recent times some millions of such mantles have been imported here. They are mostly put up in plain boxes, without the country of origin stated thereon, and not infrequently are labelled on this side with the names of British firms—thus misleading the public as to the country of manufacture. The low value of foreign currency (especially in Germany, from which most of the foreign mantles emanate) enables the manufacturers to obtain a price which, although substantially higher than is obtained in their home markets, is below the cost of manufacture here. Thus buyers here help to find money to pay the reparations, to the detriment of home industries. As the result of such imports, mantle manufacturers in this country are working with reduced staffs, and even then only at part-time, instead of its being possible, as should be the case at this season of the year, to find whole-time employment for the maximum number of workpeople.

May we through your columns enlist the co-operation of dealers and distributors and public bodies throughout the country to back-up our efforts in stimulating the demand for British-made mantles, and thus enable the large numbers of British workers engaged in this industry to be provided with full-time work at Trade Union wages, and, incidentally, save the taxpayers' money, which would otherwise be paid away in the demoralizing unemployment dole?

C. J. HEALY, Secretary,
Incandescent Mantle Manufacturers' Association.

11 12, *Pall Mall, S W., Oct. 25, 1921.*

Steaming in Vertical Retorts—Mr. Parkers' Reply.

SIR,—With regard to my contribution to the discussion on Sir George Beilby's report which appeared in the last issue of the "JOURNAL," I should be glad if you would kindly call attention to the following errors.

The item "heat taken up by coal in therms per ton—Fuel Research Board Test J" in the fuel-balance on p. 306 should read 12·77; and in the quotation on p. 307 (at the end of the section "Fuel Gas, Waste Gas, and Excess Air for Combustion") "fresh air" should read "excess air."

A. PARKER.

Leeds University, Oct. 28, 1921.

A member of the Dundee Gas Committee has appealed to the public to turn-off the gas at the meter every night. Some recent gas-poisoning fatalities have evidently been due to defective fittings.

REGISTER OF PATENTS.

Transforming Ammonia into a Salt for Use as a Fertilizer.—No. 145,038.

JOHNSON, J. Y.; a communication from the Badische Anilin- und Soda-Fabrik, of Ludwigshafen-on-Rhine, Germany.
No. 16,086; July 14, 1920.

This invention consists of improvements upon, or modifications of, the invention described in patent No. 144,659—a process according to which the ammonia employed in the manufacture of sodium carbonate by the ammonia-soda process is obtained as a fertilizer in the form of ammonium chloride in such a way that the sodium bicarbonate mother liquor is concentrated to a considerable extent in order to precipitate the common salt, and the filtrate from the sodium chloride is then cooled with a view to separating the ammonium chloride, while at the same time it may be of advantage to add to the bicarbonate mother liquor residual liquor obtained from the separation of ammonium chloride in previous operations.

It has been found that, in the process referred to, the cooling, in order to separate the ammonium chloride, can be carried out with considerable advantage by submitting the solution which has been freed from the common salt while still hot to a concentration *in vacuo*. The evaporation of the water of solution causes the temperature to fall sufficiently quickly of its own accord, and even in case of very considerable cooling no sodium chloride is precipitated along with the ammonium chloride.

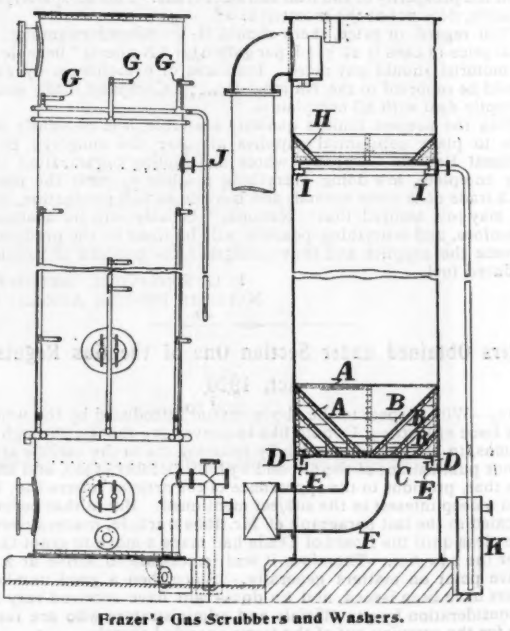
The following example illustrates how the invention may be carried into effect. The mother liquor obtained after the separation of sodium bicarbonate is first evaporated at from 60° to 80° C. and then further concentrated at 100° C. until the sodium chloride which is precipitated shows an admixture of ammonium chloride. The salt is then removed while still hot, and the filtrate (having a temperature of about 90° C.) is subjected to a vacuum in suitable apparatus. By the evaporation, for instance, of 10 p.ct. of the water of solution the temperature quickly falls to about 35° C., and large quantities of pure ammonium chloride separate out in the form of coarse crystals. This salt is removed, and the residual liquor is once more or repeatedly treated as described, or added to a bicarbonate mother liquor before the same is concentrated by heat. By intense agitation of the liquor—for example, by the introduction of a small amount of air—the evaporation and cooling in the vacuum can be accelerated.

No special cooling is necessary as a rule; the temperature falling sufficiently quickly by itself. But it may be advantageous to facilitate the ordinary external cooling of the apparatus by surrounding air, and towards the end of the process to further cool to room-temperature or even below. On the other hand—especially if the solutions have not been sufficiently concentrated—the yield of ammonium chloride may sometimes be increased by the introduction of a certain quantity of heat during the concentration *in vacuo*. The introduction of such heat is, however, limited by the fact that sodium chloride would eventually be precipitated in the case of excessive evaporation of water from the ammonium chloride liquor.

Gas Scrubbing and Washing Apparatus. No. 168,668.

FRAZER, J. K., of Glasgow.
No. 15,266; June 5, 1920.

This invention relates to apparatus for scrubbing and washing coal gas or water gas. Essential to the invention is "the provision of a tower equipped with perforated and imperforated elements over or



Frazer's Gas Scrubbers and Washers.

through which liquid flows in the form of cascades—the arrangement being such that gas ascending the tower, either through the perforated elements or over the imperforated elements, is washed by the liquid.

The apparatus shown comprises a tower the wall of which is fitted with spraying devices and the base of which constitutes a receiver for ammoniacal liquor. Spanning the base is a skeleton structure in which are mounted a series of coaxial hollow perforated frusto-conical elements A, with which are associated a series of imperforated hollow frusto-conical elements B to receive the spray and direct the liquid in the form of a series of cascades to the base. Interposed between these elements is an imperforated plate C so dimensioned as to provide at D an opening for the passage of gas from the receiver end of the tower towards the upper end. Depending from the peripheral edge of the plate is a flange which dips into a well E and thus affords a liquid seal. Passing into the receiver end of the tower and directed towards the plate aforesaid is the gas-inlet pipe F.

In the operation of scrubbing and washing, the ammoniacal liquor is pumped continuously from the receiver to the spraying devices by a pump [not shown]. It passes from the spraying devices into a state of intimate commingleme nt with the gas and descends in the form of mist. The liquor passing through is directed over the edges of B as a series of cascades through which all the gas to be scrubbed or washed is constrained to pass—the liquid flowing through the liquid seal E and thence towards the receiver.

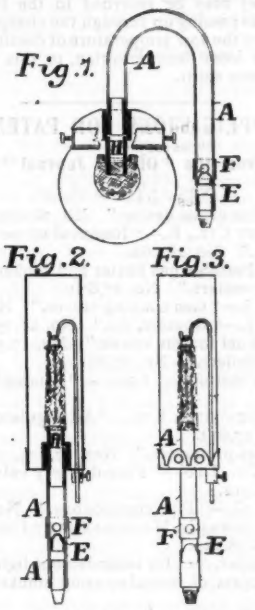
For the purpose of removing traces of ammonia from the gas a purifier is fitted near the upper end of the tower, the purifier comprising a series of spraying devices G, a cascade-forming device including a frusto-conical element H, and a liquid seal I; the excess of spray reaching the liquid seal being exhausted by a pipe J communicating with a storage tank K.

Gas-Burners.—No. 168,994.

BROWNING, C., of Teddington, and HAINS, E. A., of Kingston on-Thames.

No. 15,895; June 11, 1920. No. 26,738; Sept. 18, 1920.

This invention consists in a device adapted to fit slidably over an ordinary jet burner, so as to constitute it an incandescent burner.



Browning and Hains' Gas-Burner.

The device comprises a tube A, which has a slightly constricted outlet, and is adapted to fit slidably over an ordinary jet burner and to support a gallery and an incandescent mantle holder. Within the tube a perforated cap E is fitted a short distance above the jet burner to control the flow of gas; and on the periphery of the tube an air-regulator sleeve F is rotatably mounted above the cap to control the supply of air by bringing into register with each other holes formed in the tube A and in the sleeve. The cap is stamped out of sheet metal, and is pressed into the tube so that it becomes wedged in it; it is formed with a single central perforation which directs the current of gas past the air inlets and centrally of the tube.

The constriction of the outlet from the tube A is obtained by screwing into it a short length of thicker tube, as shown in figs. 1 and 2, or by contracting the tube itself, as in fig. 3. The usual fireclay nozzle is fitted over the tube, or the tube A itself constitutes the nozzle.

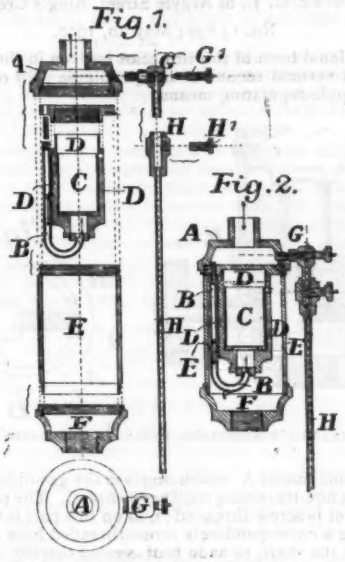
Self-Lighting Gas Controllers for Street-Lamps.

No. 169,222.

HARDY, J. T., of Sheffield.

No. 15,828; June 11, 1920.

A self-lighting gas controller in accordance with this invention comprises a main cylinder provided with an outlet at its lower end, and means for fixing a gas-burner to such outlet, and a second cylinder secured within the first cylinder in which is fitted a tubular valve; the main cylinder being also provided with a screw-on cap having a gas inlet, and the second cylinder being provided with an inlet at or near its underside to which is fitted a small inlet pipe which passes upwards within the outer cylinder into the gas-inlet cap, thus forming a gas passage from the inlet into the inner cylinder—a small outlet being formed in the wall of the inner cylinder to act as the main gas passage.



Hardy's Street-Lamp Controller.

Fig. 1 is a sectional elevation of the controller; all the parts being separated. Fig. 2 is a similar view with all the parts secured in position.

The main cylinder E has a cap F screwed on its lower end, and is provided with a threaded outlet into which the gas-burner is fixed. Inside the main cylinder is a second cylinder D, within which fits a tubular valve C. The cylinder D is fitted at its top end with a screw-on cap provided with recesses for its removal; and upon the cap is screwed another cap A. The cylinder D is provided with an inlet at its underside to which is fitted a small inlet pipe B, which passes upwards between the outer wall of the cylinder D and the inner wall of the main cylinder E. Its upper end is connected to a small screw-threaded pipe which opens into the cap A, so as to form a gas-way from the inlet into the cylinder D. A small outlet is formed near the upper end of the cylinder D and acts as the main gas passage. G is a fitting for a bye-pass regulator and the pilot-light pipe H.

Coin-Freed Apparatus.—No. 169,331.

GLOVER, W. R., and WHIMSTER, J. I., of Edmonton.

No. 21,559; July 17, 1920.

This invention relates to patent No. 25,272, of 1894, and refers to means for preventing the back-movement of the ratchet wheel at any time during the traverse of a coin in the coin-carrier arm or any forward movement of the ratchet wheel greater than that intended, and at the same time always positions the ratchet wheel with regard to the coin pocket so that a coin is always properly inserted between two teeth of the ratchet wheel and the slot in the coin-carrier arm.

The peripheral edge of the ratchet wheel is found preferably with undulations corresponding with the teeth on the face of it. The casing has secured to it a cam or track, preferably constructed with a strip connected to the axles of the ratchet wheel, so that at whatever position the cam is placed it is always in proper position with regard to the wheel. The cam (at a tangent to the ratchet wheel) is provided with a slot for the engagement of a claw as hereafter described. In the cam is a ball or roller for action against the edge of the ratchet wheel. To the casing (or to an extension of the strip) is pivoted a rocking lever, one end of which is claw-shaped to engage the slot in the cam-track and have action on the ball, the other end having a wall which acts as a stop for the cam-carrier arm. When the ratchet wheel is moved in its proper direction, the ball or roller rides free; but the moment any attempt is made to move the ratchet wheel backwards, its edge immediately jambs the ball in the cam or track and any movement is prevented.

In action, the coin after insertion is carried by the coin-carrier arm and the teeth of the ratchet wheel, and when the arm with the ratchet wheel has been revolved the full distance, the arm comes against the wall of the rocking lever and moves the rocking lever for the claw end to pass into the slot of the track and engages the ball—drawing it close up against the edge of the ratchet wheel and hold it tightly. At the same time by the ball obtaining a proper bearing in one of the undulations on the edge of the ratchet wheel it will position the ratchet wheel correctly, ready for the coin slot of the coin-carrying arm to coincide with the space between two teeth when the arm is returned. On the return of the coin-carrying arm, the rocking lever will return, due to the preponderance of weight on the claw end; but the ball will hold the ratchet wheel in place.

This action of the claw on the ball will prevent any forward movement of the ratchet by momentum, as the moment the rocking lever is acted upon, the ball is pushed against the ratchet wheel to stop and hold it. In one case the ratchet wheel is prevented being given a back movement when the coin is actuating the ratchet wheel, and in the other case is prevented being given a forward movement by a sudden and swift movement of the coin carrier arm.

Adjusting the Inflow of Gas to a Burner. No. 168,133.

ALEXANDER, C. J., of Argyle Street, King's Cross, W.C.

No. 13,890; May 20, 1920.

A constructional form of this invention is given in the accompanying illustration—a vertical section of the gas-nipple with regulator, and a plan of the nipple-regulating means.

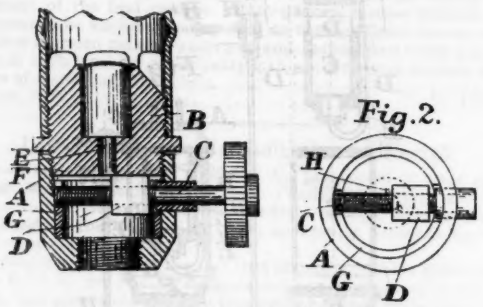


Fig. 2.

Alexander's Adjustable Inflow to Gas-Burners.

In a socket component A, which receives the gas-nipple B, is rotatably mounted a non-traversing transverse shaft C. The part of the shaft within the socket is screw-threaded; and on this part is fitted a sliding-valve D having a correspondingly screw-threaded hole to engage the screw-thread of the shaft, so as to be traversed thereby across the gas-way E in the perforated base F of the nipple B. A support for the inner end of the shaft is a notched ring G. A gas-thread connection of the socket and nipple component serves well.

In conjoining these, the arrangement is such that the valve D is operatively seated against the perforated base of the gas-nipple B, and also so as to allow the exertion of such a pressure on the valve as shall preserve its setting under all usual conditions, and whether the screw-nut fitting of the valve is tight or loose on its screw. The nipple may be constructed so that the gas admitted by the single aperture E is discharged by multiple small apertures H. A thumb-and-finger wheel serves for rotating the shaft C.

Coin-Freed Meters.—No. 169,332.

GLOVER, W. R., and WHIMSTER, J. I., of Edmonton.

No. 21,561; July 17, 1620.

This invention relates to patent No. 25,272, of 1894—for means for locking the ratchet wheel at the end of the movement of the coin-carrier arm and so preventing any forward movement of the wheel by other means than the insertion of a coin.

On some part of the coin-carrier arm are formed two inclines at a distance apart, in reverse order, and concentric with the axle of the coin-carrier arm. To the price-changer plate at the part at which the stop is usually positioned is pivoted a rocking lever at an angle to the axle of the coin-carrier arm, with the pivotal point positioned between the radius of the two cam or incline surfaces. One end of the lever is so formed that it can engage between two teeth of the ratchet wheel, and is also provided with a nosepiece against which one of the cams acts, while the other end has a nose against which the other cam surface acts. As the coin-carrier arm is moved back after the release of a coin, and just at the end of its movement, one cam rides against the nose, and moves the rocking lever over for the end to engage the ratchet wheel and hold it. At the same time the other end is riding down its cam; and, on a reverse action, the other end of the rocking lever will be lifted and the end engaging the ratchet wheel removed from engagement with the teeth, leaving the rocking lever free.

By this invention the rocking lever acts as a stop to the coin-carrier arm, and at the same time prevents any movement of the ratchet wheel from any cause whatever on the end of the movement of the coin-carrier arm.

Low-Temperature Carbonization.—No. 169,580.

TOZER, C. W., of Victoria Street, Westminster.

No. 22,637; July 30, 1920.

The patentee in his specification [not illustrated] points out: It has been proposed to operate a coke-oven, gas-retort, or the like fuel carbonization apparatus having side walls, containing flues, under a pressure within the carbonization chambers, between 15 in. mercury vacuum, and 100 atmospheres pressure, and at a temperature between 200° and 1400° C. It has also been proposed to mix the fuel, such as coal, with up to 10 p.ct. of its weight of a resinous binder; then compressing the coal to form briquettes, which are perforated, bored, or the like, to increase their surface; and then carbonized under a suction of 0·025 to 12 in. of mercury, and at a temperature of 500° to 650° C.

To obtain the best results in such low-temperature carbonization—especially when use is made of the retort described in patent No. 7116 of 1914, or in patent No. 168,229 (more particularly with regard to securing the greatest possible yield of light hydrocarbons or motor spirit)—it has been found necessary to perform the carbonization at a specific temperature and under a specific partial vacuum.

The present invention is characterized by the feature that the carbonization process is carried on at a temperature not exceeding about 600° C.—preferably between 400° and 600° C.—and with a vacuum of from 70 to 150 mm. of mercury gauge in the retorts, and that no binder is used for the fuel.

For the purpose of obtaining the best yield of product from such carbonization, it is necessary to pass the evolved gases through a series of specific operations or processes; and a further object of this invention relates to the sequence in which these processes are carried out.

After the gases are produced by means of the retort heated to the specific temperature and have been exhausted or withdrawn from the retort under the specific partial vacuum, the gases are subjected to condensation by means of any atmospheric or water-cooled condenser. When all precipitation of tar vapours by cooling has ceased, all suspended liquid matters, or what is known as tar fog, in the gases are removed by a process of friction.

After all suspended liquid particles have thus been removed, the gases pass to the vacuum pump or exhauster applied to produce the specific vacuum in the retorts. The condensers and friction appliances, being situated on the way to, or at the inlet of, the pump or ex-exhauster, are, in consequence, working under a vacuum.

On leaving the outlet of the pump, the gases are under a moderate pressure equal to some few centimetres of water-gauge. This pressure is augmented and intensified by passing the gasses into a compressor and thereby subjecting them to pressure of about four to five atmospheres. By suddenly and automatically releasing this pressure, and thereby causing a sudden expansion of the gases, a portion of the light gaseous hydrocarbons in the gases is separated in liquid form similar to petrol, and is collected and recovered from the compressing apparatus—the sudden expansion also causing a reduction in temperature which greatly increases the efficiency of the ammonia and oil washing apparatus.

The gases, having now been restored to the moderate pressure at which they entered the compressing apparatus, are passed through an ammonia washer or scrubber whereby all the ammonia contained in the gases is recovered. Then they are passed into an oil washer, whereby the light hydrocarbons or petrol vapours are absorbed by the wash-oil, which, on becoming saturated, is distilled and yields-up the absorbed hydrocarbons in a liquid form as motor spirit.

It is evident that petrol is thus recovered from the gases by two methods—first by compressing and suddenly expanding the gases, and, secondly, by washing the gases with a suitable oil.

A portion of the cooled stripped gas (of which the principal constituent is methane) may be returned to the lower portion of the retorts—such gas, in passing up through the charge, acting as a gaseous envelope to regulate the low temperature of distillation and protect the light hydrocarbons from decomposition, in this way securing an increased yield of motor spirit.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 26.]

Nos. 27,456 to 28,131.

BANSEN, H.—"Gas or air heater." No. 28,129.
BARBET ET FILS ET CIE., E.—"Removal of tar from vapours from distillation of wood." No. 28,060.
BEDFORD, H.—"Portable gas heater and cooker." No. 27,866.
BERRY, J.—"Gas-meters." No. 27,679.
BILLINGTON, W. J.—"Gas cooking-stoves." No. 27,751.
BILLINGTON, W. J.—"Geysers, &c." No. 27,752.
BIRCH, S. E.—"Fuel for gas stoves." No. 27,556.
BRUSTER, O —"Boilers." No. 27,861.
CANNON IRON FOUNDRIES, LTD. —"Atmospheric gas-burners." No. 27,612.
CANNON IRON FOUNDRIES, LTD.—"Air-regulators for atmospheric gas-burners." No. 27,613.
CLIMIE, W.—"Gas-producers." Nos. 27,625, 27,626.
CONDENSED GAS CO., LTD.—"Fine-delivery valves for oxygen, &c., cylinders." No. 27,712.
CONSTANTINESCO, G.—"Pipe connections." No. 27,974.
FAÇONEISEN-WALZWERK L. MANNSTAEDT ET CIE. AKT.-GES.—"Gas or air heater." No. 28,129.
FAYOL, G.—"Mantles, &c., for incandescent lighting." No. 27,685.
FISHER, A.—"Process of manufacturing smokeless, &c., fuel from coal." No. 27,462.
FOWLER, R.—See Berry, J. No. 27,679.
GRAFTON, O. C.—"Gas-governors." No. 27,724.
HASSALL, W.—"Gas fire-places and fires." No. 27,753.
HAWTHORNE, H. S.—See Cannon Iron Foundries. Nos. 27,612, 27,613.
IRONSIDE, T. G.—"Distilling oil-shales, coal, &c." No. 27,761.
METERS, LTD.—See Berry, J. No. 27,679.
MIDLAND COAL PRODUCTS, LTD.—See Fisher, A. No. 27,462.
MOTTRAM, A. H.—See Bedford, H. No. 27,866.
REES, T. L. H.—See Billington, W. J. Nos. 27,751, 27,752.
SALOMONS, SIR D. L. GOLDSMID-STERN-.—See Fayol, G. No. 27,685.
UMPLEBY, F.—"Gas-generators." No. 27,946.

Chester United Gas Company.

At a meeting of the Chester Corporation Watch Committee the Town Clerk reported his interview with Mr. Douglas Dobie (Solicitor) and Mr. F. A. Pye (Manager and Secretary of the Chester United Gas Company), when they stated that the Chester Corporation were the only objectors to the application made by the Company to the Board of Trade for an Order under section 1 of the Gas Regulation Act, 1920; that the Board of Trade would very shortly fix a date for an inquiry into the application and the objection thereto; and that the Parliamentary Agents of the Company had advised that, if possible, an agreement should be come to between the Company and the Corporation prior to the inquiry. After a long discussion, the representatives of the Company stated that they were prepared to advise an amendment of the application by reducing the proposed maximum charge for gas to consumers in the City of Chester from 1s. 6·85d. to 1s. 5d. per therm. An explanatory report from the Gas Examiner was read, after which the Committee resolved "that the Board of Trade be informed that the Corporation will agree to 1s. 5d. per therm being fixed as the maximum price which the Chester United Gas Company shall be authorized to charge for the supply of gas within the city."

PARLIAMENTARY INTELLIGENCE.

THE NEW MODEL GAS BILL.

Changes Necessitated by the Gas Regulation Act.

It is some time now since there was issued a revision of the Model Bills and Clauses; but it has been general knowledge that the Private Bill Authorities have been considering the question of bringing the Model Gas Clauses into conformity with the new legislation applying to the industry. On Monday of this week, there was issued from the King's Printers a new set of Model Clauses; and a comparison shows that the changes indicated below have been made.

The whole of the initial clauses, including those referring to capital, limitation of profits, auction clauses, gas-works residual products, &c., and lands—are in the same terms as in the last issue of the Model Clauses. In clause 19, side-headed "Limit of Price," there is found the first reference to the charge being on the therm basis.

> 19.—The price to be charged by the Company for gas supplied by them to persons who shall burn the same by meter shall not at any time exceed per therm.

In view of the changes made in the next clause, this also may be reproduced *in extenso*:

> 20.—The standard price to be charged by the Company for gas supplied by them shall be per therm:
>
> Provided that the Company may increase or reduce the price charged by them for gas above or below the standard price, subject to a reduction or increase in the dividend payable by the Company on the ordinary share capital or stock as follows:
>
> In respect of any year during any part of which the price charged by the Company shall have been above the standard price, the dividend payable by the Company shall in respect of each by which the standard price shall have been increased be reduced below the standard rate of dividend by on every one hundred pounds of ordinary paid-up capital *with a ten per centum standard rate of dividend, and by on every one hundred pounds of such capital with a seven per centum standard rate of dividend*, and so in proportion for any fraction of one hundred pounds;
>
> And in respect of any year during the whole of which the price charged by the Company shall have been below the standard price, the dividend payable by the Company may in respect of each by which the standard price shall have been reduced be increased above the standard rate by on every hundred pounds of ordinary paid-up capital *with a ten per centum standard rate of dividend, and by on every one hundred pounds of such capital with a seven per centum standard rate of dividend*, and so in proportion for any fraction of one hundred pounds.

The discounts clause is precisely the same as before. In regard to the prepayment meter clause, the fixed charges of 10d. per 1000 c.ft. for meter and fittings, and the 1s. when the fittings include a cooking-stove, together with the other authorized charges for prepayment meter alone, are cancelled; and the places occupied by these charges are now blanks, and the term "per 1000 c.ft." has been in every case altered to "per therm."

It follows that the whole of the clauses relating to the calorific power and testing of gas have been deleted in the new Model Clauses. This also applies to the question of pressure, as these matters naturally fall for authorization under section 1 of the Gas Regulation Act. This is emphasized in clause 23, which deals with the question of the prescribed testing place "for the purposes of the Gas Regulation Act, 1920," which is the first time it is shown in these Model Clauses tha the Gas-Works Clauses Act of 1871 has been superseded in this regard by the new Act. The clauses side-headed "Saving as to Penalties" has also disappeared from the Model Clauses, in view of the fact that penalties relating to pressure, quality, impurity, &c., are dealt with under the Gas Regulation Act. The succeeding clause deals with the construction and placing of pipes, &c., between mains and meters.

There appear to be no changes in the clause referring to the undertaking paying interest on money deposited as security for gas-meter, &c., nor in that providing for the supply of gas-fittings, &c. Next comes the clause relating to consumers giving notice to the Company before removing; and then there is a new clause dealing with the expenses of re-connecting a discontinued supply. This clause is as follows:

> 28.—In any case in which, in consequence of any default on the part of the occupier of any premises, the *Company* have cut-off the supply of gas to such premises, and the occupier so in default shall desire to resume such supply, he shall pay to the *Company* the expenses of re-connecting the supply, and the *Company* shall not be under any obligation to supply gas to such occupier until he shall have paid such expenses.

A further new clause in the Model Bill is in respect to the removal of fittings where a gas supply has been discontinued. This clause reads:

> 29.—The power to enter premises and remove pipes, meters, and fittings or apparatus conferred upon the *Company* by section 22 of the Gas-Works Clauses Act, 1871, shall extend to all cases in which any person entering into occupation of any premises previously supplied with gas by the *Company* shall not require to take a supply of gas from the *Company* or to hire all or any of the pipes, meters, fittings, or apparatus belonging to the *Company*.

Another new clause refers to the use of anti-fluctuators in connection with gas-engines; but though new for the Model Bill, this is a clause which has appeared in quite a large number of Gas Acts during recent years. So customary has it become to insert this, that it is hardly worth while reproducing it from the Model Clauses.

The next clause is one in which the National Gas Council have taken a considerable interest. It refers to the provision of valves where high-pressure air is used; and it was given in our issue for Sept. 28 last [p. 714].

There is no change in the clause treating of the period of error in defective meters; but a clause providing for supply outside the limits of the undertaking by contract with local authorities, &c., for sale in bulk has been excluded, and in its place appears one headed "Supply to, and by, Other Undertakers." This is as follows:

> 35.—The *Company* may contract with any local authority, company, or persons for the supply by the Company to them, or for the supply to the *Company* by them, of gas in bulk upon such terms and conditions as may be agreed upon; but nothing in this section shall authorize the *Company* to lay any mains or interfere with any street beyond the limits of supply.

The clause "Failure to Supply" still appears; and the Model Bill concludes with the provision now common in most Gas Acts conferring upon the promoters the power to take licences for the use of patents.

HOUSE OF COMMONS.

Gas Regulation Act Applications.

Sir R. NEWMAN asked the President of the Board of Trade whether he was aware that many complaints were being made by gas companies at the delay of the Board in replying to their applications for relief under the Gas Companies Regulation Act, 1920; and whether, in view of creating employment in works of extensions and renewals, steps would be taken to expedite the Board's decision when these applications are made.

Mr. BALDWIN said he understood that a few complaints had been made of delay in dealing with particular applications for a revision of the statutory price of gas. There had been no avoidable delay in dealing with the applications; but it would be realized that each case required careful and detailed examination, and while every effort was made to expedite the decisions of the Board, he feared that it would be some time before the whole of the cases could be dealt with.

Gas Regulation Act, 1920.

Copies were presented to both Houses of Draft Special Orders proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Borough of Newry and the Plymouth and Stonehouse Gas Light and Coke Company.

LEGAL INTELLIGENCE.

PREPAYMENT METER-BOX DEFICIENCIES.

Cases at Margam.

A sequel to what was known locally as the "Margam Meter Scandal" was heard at the Port Talbot Police Court on Monday of last week, when four persons living in the houses erected for Messrs. Baldwins, Ltd., at Port Talbot, were summoned for obtaining gas by means of a trick.

Mr. Vivian Deer prosecuted on behalf of the District Council.

Bryn Morris, collector to the Council, said that on Sept. 14 he called at one of the houses to check the meter, and found it contained only 8s., instead of £2 3s. There were two filed halfpennies in the meter, and one jammed in the slot.

Defendant said the coins were put in accidentally by his son; and witness told him to report it. "I did not steal the gas," he declared, "The authorities should have come to me, and I would have paid the money. It is ridiculous to bring me here on such a charge."

In the three other cases, Mr. W. M. Thomas (Bridgend) defended. The collector said that when he called at the house occupied by Mr. Bowen, the meter contained £3 9s., or a deficiency of 19s. There were a number of foreign coins in the meter, including Greek and Belgian coins, a brass disc, and sixteen halfpennies, all filed.

Mr. Evan Rees, the Gas Manager, said that occasionally people put a florin or some other coin in the meter; but they always notified the collector before he emptied the box.

Bowen, giving evidence, said that it was the practice in the district when shillings were not available to put halfpennies or similar sized coins in the meter; and afterwards the consumers paid-up when the collector called.

David Evans, another collector employed by the Council, said it was a common practice in the district to put foreign coins in the meter; but so long as the value of the coins used was paid in full when the collector read the meter, no objection was raised.

The other two cases were against C. P. Davies (where the deficiency was 10s.), and Charles Hacker (where the deficiency was £3 11s.). This meter contained a Russian coin, sixty filed halfpennies, and a brass disc.

The Chairman (Mr. Byass) said the bench did not think the defendants had any intention of stealing the gas, and hoped the practice, which was a very irregular one, would be discontinued.

The summonses were all dismissed on payment of costs.

Burners (1921), Ltd.—A private company has been registered under this title, with a capital of £3000, to carry on business as manufacturers of gas burners and gas and electric fittings and lamps, and dealers in, and factors of, incandescent mantles. Directors: Messrs. J. S. Burgoyne and A. J. Kingdon. Solicitor: Mr. C. H. Hunt.

MISCELLANEOUS NEWS.

GAS REGULATION ACT ORDERS.

There has been forwarded by the Director of Gas Administration a copy of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Herne Bay Gas Company, Ltd.

After the declared date—(1) The standard price in respect of gas supplied by the undertakers shall be 16·2d. per therm; (2) the price of 16·6d. per therm shall be substituted for 3s. 8d. per 1000 c.ft. wherever it occurs in sub-section (2) of section 14 (price of gas with sliding-scale as to dividend) of the Herne Bay Gas Act, 1912.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four. (Oct. 24.)

Hessle Gas Light and Coke Company.

After the declared date—(1) The standard prices in respect of gas supplied by the undertakers shall be 16·4d. and 17·6d. per therm; and these prices respectively shall be substituted for the prices of 3s. 6d. and 4s. per 1000 c.ft. mentioned in section 58 (dividends dependent on prices charged) of the Hessle Gas Act, 1905. (2) "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in paragraph (1) of section 77 (for protection of Rural District Council of Sculcoates) of the Hessle Gas Act, 1905.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-quarter.

Prepayment meter clauses are included. (Oct. 28)

HEYWOOD CORPORATION GAS-WORKS RESULTS.

In his report to the Gas Committee for the year ended March 31, Mr. Walter Whatmough, the Engineer and Manager, stated that the gross revenue for the year amounted to £45,100 3s. 1d., and the gross expenditure (less interest and sinking-fund) to £41,303 14s. 4d., leaving a gross profit of £3796 8s. 9d.—a decrease of £1872 0s. 3d. compared with the previous year. The amount paid for interest and sinking-fund was £6625 19s. 1d., leaving a net loss of £2829 10s. 4d. The receipts for gas sold for all purposes amounted to £32,409 12s. 11d., compared with £28,102 11s. 1d.—an increase of £4307 1s. 10d., due to a further advance in the price of gas. Residual products gave an increased income of £2735 1s. 2d. The increased cost of manufacture of £7509 19s. 5d. was a very heavy charge; fuel alone being responsible for £5479 19s. 9d. The balance of the increase was entirely due to the increased cost of material and wages. The total increased expenditure summarized as follows:

Coal	£5500
Wages	1400
Rates and taxes	650
Interest	700
Material	560
Special expenditure	800
	£9610

It should be borne in mind that the unfortunate strike of the workmen in October last year, when the works had to be closed-down, was a serious loss to the Department. During the year, 9847 tons of coal had been carbonized, and 395 tons of coke used for water-gas manufacture; the average make per ton being 13,348 c.ft. The total quantity of gas manufactured was 136,726,000 c.ft., an increase of 1,112,000 c.ft., and the total quantity of gas sold as registered by the consumers' meters is 124,334,000 c.ft., an increase of 1,583,000 c.ft. The quality of the coal was again a source of anxiety; and the difficulty in not being able to obtain material in time (although ordered twelve months previously) for renewals before the winter season necessitated gas manufacture being carried out under adverse conditions. The unaccounted-for gas totalled 7·46 p.ct. Particulars of consumption for the year were as follows:

	Cubic Feet.		Per Cent.
Shops and dwellings, ordinary meters	43,728,530	..	34·53
,, ,, ,, prepayment meters	30,926,700	..	24·42
Mills and workshops	10,182,700	..	8·04
Public lamps	1,187,949	..	0·94
Stoves	27,044,850	..	21·35
Motive power	11,192,200	..	8·83
Offices, works, and showrooms	1,516,300	..	1·19
Gas-engines at works and showrooms	809,700	..	0·64
High-pressure lighting	71,055	..	0·06
Total consumption	126,659,984	..	100·00

The gas consumed in dwellings and shops by ordinary meters showed an increase of 1,075,550 c.ft.; prepayment meters, 3,300,200 c.ft.; public lighting, 286,226 c.ft.; and stoves, 2,462,850 c.ft. Mills and workshops showed a decrease of 2,977,650 c.ft., and motive power 2,534,300 c.ft.

Owing to the large increase in the cost of coal, wages, and materials, there was no alternative but further to increase the price of gas 6d. per 1000 c.ft. in the September quarter, 1920. The average price realized for the year was only 5s. 2·56d., compared with 4s. 6·95d. for the year ended March, 1920—an increase of 7·61d. only, representing an increased income of £3942 against an increased expenditure (less increased receipts) of £6197. The small increase was partially due to the Government rebate, which represented the sum of £1050, and which would stand to the credit of revenue next year. The consumption owing to bad trade in the staple industry still showed a deficiency of 13 millions, as compared with 1914; and until there was a return to improved conditions, satisfactory financial results could not be attained.

The reduced output, together with the large increased cost, had a very important bearing upon the fixed charges of the undertaking, as this item alone compared with last year is 2·69d. per 1000 c.ft. more, representing the sum of £1400. Compared with the year ended March, 1914, it was equal to the large sum of 10d. per 1000 c.ft.—a loss of £5180 per annum. Provided, however, the present sales could be maintained, there was a prospect of an increased income next year of £2000, owing to the increased price being in operation for only a portion of the present year and the discontinuance of the Government rebate. In these circumstances, the Committee had decided not to increase the price of gas except to bring up the present basic price of gas for stoves and engines to the same level as the lighting rate.

One setting of the vertical retorts would require renewal prior to next winter, as this portion of the plant had been in operation for eight years. The purifying machine and oxide purifiers would also require to be put into a satisfactory condition.

NOTTINGHAM GAS SUPPLY.

Dissatisfaction with the alleged poor quality of the Nottingham Corporation gas supply has recently spread to the extra-municipal districts, including important mining centres, over which the municipality holds statutory powers; the severest criticisms emanating from the Parish of West Bridgford. Matters came to a head at the last meeting of the Notts County Council, when it was proposed that the various local authorities should take steps to appoint a Gas Examiner to test the quality and pressure of the gas supplied.

The point was urged by Alderman Heath, a leading county agriculturist. "People who sold bad milk were prosecuted," he said. "Why not those who sold bad gas?" Mr. Farmiloe questioned whether such an appointment was justified at a time when economy was so much needed; but it was urged that the expenditure would fall on many authorities, and the recommendation was adopted.

The municipal view is that the outside districts have been well served. They have bornenone of the capital costs involved in providing a supply of gas; nor have they rendered themselves responsible for continued financial obligations in connection with the undertaking. They should therefore moderate a representation not based upon equitable grounds. There is no doubt, however, that in spite of the difficulties met by the Nottingham Gas Committee, the standard of supply has left much to be desired. The prevailing policy is to extract the maximum profit for the relief of municipal burdens; and though it is recognized that such an undertaking must be run at a reasonable profit, there is much dissatisfaction with the high charges imposed. Assurances that charges will be reduced when labour and other costs fall are countered by assertions that the ordinary prudent policy of augmenting reserve funds has been carried to an indefensible extent during a period of exceptional financial stress.

FISHERIES POLLUTION.

Working-Scale Experiments.

A paragraph on p. 354 of the "JOURNAL" for Aug. 18, 1920, stated that the Joint Committee appointed by the Ministries of Transport and of Agriculture and Fisheries to investigate damage to fisheries by the tarring of roads, had established an experimental station at Alresford on the River Itchen in Hampshire, in order to test on a large scale the results obtained in the laboratory.

The roadway adjoining the experimental station was recently tarred, and the rain washings from it were diverted into specially constructed ponds stocked with fish. It is proposed to continue observations on the tarred road washings throughout the life of the tarred surface, as it is possible that in its final stages of disintegration the tarred surface may revert to a condition in which it has a greater pollution action on rain-washings.

Meanwhile, it may be tentatively concluded that rain-washings from a water-bound macadam road surface are not in any ordinary circumstances injurious to fish or fish food. The first rain-washings from a road surface which has been recently tarred (say, within a week) will certainly be injurious unless mixed with at least an equal volume of clean water, and may be injurious unless mixed with a considerably larger volume. Dilution with at least ten times their volume of clean water will prevent injury. Subsequent rain-washings from a tarred road in the early stages of its life are not injurious provided they are mixed with at least an equal volume of clean water. Filtration through freshly-cut turf reduces the risk of injury, and storage reduces in some respects the toxic character of the washings. There is no evidence that pond vegetation is injured by rain-washings from a tarred road.

These conclusions apply when the tar used complies substantially with the Road Board Specification for Tar No. 1.

The Incombustibles Report.—In their report which was adopted at last week's meeting of the London County Council, the Public Control Committee, referring to the recommendations of the Departmental Committee on Incombustibles in Gas, said: "In view of the possibility of a further inquiry being held after a period of three years, it appears desirable that the practice which has obtained hitherto of analyzing samples of gas supplied to London and collecting evidence on the subject should be continued; and we have given the necessary instructions to this end." The Finance Committee have no observations to offer as no financial questions appear to arise.

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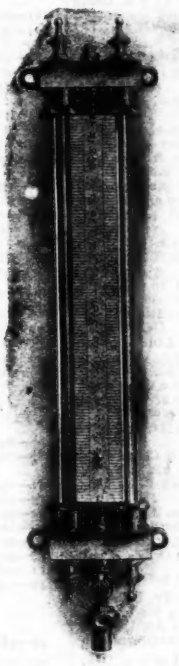

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 31.

Pitch continues a quiet market, and little business is reported. The price is called 60s. per ton net f.o.b makers' works. Creosote is steady at about 8d. per gallon, net and naked. Tar spirits continue in good demand; pure benzole and pure toluole being about 3s. 6d. per gallon, and 95-160 solvent naphtha from 3s. to 3s. 3d. per gallon. All other products remain unchanged.

Tar Products in the Provinces.

Oct. 31.

The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 54s. Pitch, East Coast, 60s. to 62s. 6d.; West Coast—Manchester, 52s. 6d. to 55s.; Liverpool, 52s. 6d. to 55s.; Clyde, 52s. 6d. to 55s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 7½d. to 7¾d.; salty, 7d. to 7¼d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £15 to £20; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

The position in tar products has undergone no change. There is still very little inquiry for forward business. Pitch remains quiet and unsettled. Foreign buyers are holding off the market, and prices still have a downward tendency. Probably 55s. represents the average value. Naphthalenes are quiet, with crudes ranging from £5 to £8 per ton and refined from £14 to £18 per ton. Solvent naphtha still remains at 2s. 10d. to 3s. per gallon; supplies being now comparatively plentiful. Although the rubber manufacturing industry is purchasing to a larger extent than recently, there is really very little fresh business about. Cresylic acid is inactive, and is quoted at 2s. 3d. per gallon for 97-99 p ct. quality, and 1s. 9d. to 2s. for dark 95-97 p.ct. quality. Carbolic acid is unchanged from 1s. 6d. per gallon for crude 60's, and 6d. per lb. for 40 p ct. crystals. Creosote is on the downward grade, and does not make more than 8d. per gallon. Benzole 90 p.ct. is steady at 2s. 1d., and pure benzole at 3s. 6d. Business in intermediate products is quiet; but the policy of buying to cover immediate requirements is still being pursued. There are many foreign inquiries in the market; but little business is actually passing.

Sulphate of Ammonia.

The position in sulphate of ammonia is unchanged. There is a satisfactory demand for home trade, and also for abroad, especially from France. The latest export values are £16 10s. per ton; while home prices for November are £15 8s. per ton for neutral 25¾ p.ct. ammonia quality, or £14 10s. per ton for ordinary 25¼ p.ct. ammonia quality. The December prices are 5s. dearer in each case.

Services on Housing Estates.

The Housing Committee of the Hammersmith Borough Council report that they have for some time been in communication with the Ministry of Health with regard to the question of the supply of gas for cooking purposes to the houses on the Wormholt Estate, more particularly in regard to the terms laid down by the Ministry that approval to the payment of £10 per house to the Gas Company was conditional upon the supply by the Company of a gas-cooker and prepayment meter loaded to the statutory additional charge to cover the rent of the meter and cooker. To these exact conditions the Company have refused to agree; and the Ministry have intimated that they cannot see their way to alter the terms, though with a view of expediting settlement the Ministry state that they would be prepared to approve the Company's offer to instal, for an inclusive sum of £15 per house, a complete gas lighting and cooking system, including prepayment meter, cooker, and lighting fittings free of charge by way of hire to tenants other than the charges collected by the prepayment meter. To the adoption of the latter course the Committee cannot see their way to agree, and have accordingly considered alternative methods to meet the position. Under the present contracts, the sum of £7 10s. per house for gas service has already been passed by the Ministry; and it is estimated that this sum, together with a sum of £1 10s. per house over the whole estate, would enable the Council to meet the subsidy of £10 per house to the Gas Company for a supply. They have, therefore, arranged with the Brentford Gas Company that before services can be supplied, a sum of £1 10s shall be paid by the occupier to the Council, in addition to the usual charges made by the Gas Company for connecting-up.

Tunbridge Wells Misadventure.—"Death from misadventure" was the verdict returned by Mr. A. H. Neve (Coroner), who inquired without a jury on Tuesday of last week, at the Tunbridge Wells General Hospital, into the death of Eliza Katherine Garde Blake, widow of an Irish clergyman. Deceased had been staying at 3, Amherst Road, coming from a nursing home at Hindhead. On Saturday morning she was found dead in bed. The room was full of gas; the tap being almost full on. Miss Isobel Gotherd, of the above address, told the Coroner that she was in the habit of turning-off the gas at 10 p.m. and on again at 7 a.m., and that deceased was informed of this on the evening of her arrival. After hearing further evidence, the Coroner said he had no doubt in returning the verdict above mentioned.

Cardiff Gas Supply Classes.—An evening class in gas supply has been arranged to commence early this month at the Cardiff Technical College, at a fee of 12s. 6d. for the session. Those who intend to join should communicate with Mr. Octavius Thomas, Gas and Water Offices, Pentre, Rhondda.

Tamworth Gas Company.—A meeting of the Tamworth Gas Light and Coke Company was held last week, when the Directors reported that the profit for the year ended June 30 amounted to £1343. A dividend for the half year ended December at the rate of 10 p.ct. on the old shares and 7 p.ct. on the new shares was paid in March last; and the Directors much regretted that it would be impossible to pay any further dividend for the year. The reason given was the coal strike. The Company were compelled to pay greatly enhanced prices for inferior coal; and there was a large decrease in consumption. The report was adopted.

Cost of the Coal Strike to the Croydon Company.—The Croydon Gas Company make the following statement in the October issue of the "Croydon Co-Partner:" The coal strike, April 1 to July 4, 1921, £18,000 approximately represents the cost to this Company, mainly through enforced purchases at extremely high prices of inferior foreign coal, the proceeds of which went out of the country. This is the explanation of the increase of ⅜d. per therm in the price of gas, which the Directors found it necessary to make this month. It is hoped that next year we shall be able to see the commencement of a marked and steady reduction in price. It is due to the Gas Light and Coke, South Metropolitan, and South Suburban Companies to acknowledge the assistance we received in the supply of coke, which, in addition to helping to keep our water-gas plants going (thus tiding-over the critical period of the strike), enabled us to supply all the necessary requirements of our consumers for this cheap and useful fuel.

STOCK MARKET REPORT.

THE opening day on the Stock Exchange last week showed almost general depression, with only a fair line here and there. However, by mid-week things were looking a little less gloomy; and they retained a modicum of the recovery to the close.

In the gilt-edged market, Home Government issues were uneven; Consols being unchanged, War Loan and Funding down, and Victory up. Friday's figures were: Consols 48⅝-49, War Loan 87⅜ 87 5/16, Funding 71⅜-71¾, Victory 77¾-78⅜. Bonds eased; but new Colonials were fair. Home Rails continued very dull, Canadians were irregular, and Argentine flat. The Foreign Market was weak.

The Miscellaneous Market had to contend with renewed liquidation. Rubber and Oil were hit; but Iron and Steel and Textiles held on fairly.

Business in the Gas Market was about abreast of the previous week in point of volume; but the minor undertakings contributed but little to the sum total. There was a pause in the remarkable advances recently made in quotations, and some recoiled slightly. In the London Companies, Gas Light receded 1¼, and South Metropolitan and Commercial 3½ p.ct. each. The Suburban and Provincial group were immune, and retained all their previous gains. British was even ½ higher. In the Continentals, Imperial effected a recovery, and closed at 136-41 *ex div.* European was marked ½ lower.

Bargains done for cash during the week were as follows: On Monday, Bombay 62s., Brentford "A" 68½, ditto "B" 65, Commercial 3½ p.ct. 52, Gaslight ordinary 57¼, 57½, Imperial Continental 135, 135⅝, 136½, 137, Lea Bridge 72½, South Metropolitan 67, 67¼, 67⅜, 68, ditto 6½ p.ct. debenture, 101¼. On Tuesday, British 23, 23¼, Buenos Aires debenture 44, 44¼, Commercial 4 p.ct. 56½, Gaslight ordinary 56⅝, 57, 57 5/16, 57½, Imperial Continental 135, 135½, 137, Lea Bridge 72½, Oriental 88⅝, Primitiva 13s., ditto preference 38s., 38s. 9d., San Paulo 6¼, South Metropolitan preference 93½, ditto 6½ p.ct. debenture 101¼, Hampton Court 5 p.ct. ordinary 50. On Wednesday, Brentford "A" 68½, ditto debenture 58½, 59, Brighton and Hove ordinary 84, European 6¾, Gas Light ordinary 56½, 57, ditto preference 59, 59½, ditto debenture 51½, 52, Imperial Continental 136, 136½, 138, 138½, ditto debenture 82¼, 83, Primitiva preference 38s. 6d. South Metropolitan 68, ditto debenture 50, ditto 6½ p.ct. debenture 101½, 101⅝, South Suburban debenture 74, Wandsworth "B" 59, ditto debenture 45. On Thursday, Bombay 61s., 62s. 6d., Brentford "B" 65, Brighton and Hove ordinary 84, 85, Bristol 70 5/16, Cape Town 6¼, European £6 19s. 6d., Gas Light ordinary 56⅝, 57¼, ditto maximum 44¼, ditto debenture 51¼, Imperial Continental 138, 139, 139½, 140, 140½, 141, Primitiva 14s., ditto preference 38s. 3d., 38s. 6d., 38s. 9d., South Metropolitan 66½, 68, ditto preference 93½, 94, ditto 6½ p.ct. debenture 101¼, Bristol 4 p.ct. debenture 56 5/16, Wolverhampton 8 p.ct. debenture 102, 102⅜. On Friday, Bombay 61s. 3d., Brentford "B" 64½, British 22⅜, Gas Light ordinary 56½, 56⅝, 56⅞, 57⅛, ditto maximum 45, ditto preference 59¼, Imperial Continental 137½, 138, 139, Hornsey 102½, ditto preference 65¼, Ilford "A" and "C" 80½, 81, Oriental 89, South Metropolitan 67½, ditto preference 94, Romford 7 p.ct. "B" 62s. 6d., ditto 4 p ct. debenture 49½, 50., ditto 4½ p.ct. debenture 55½, 56.

In the Money Market, the same condition of extraordinary ease, which characterized the preceding week, continued. Silver fluctuated widely, eventually closing at an advance of 1d. The Bank rate is 5½ p.ct., as fixed on July 12.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Oct. 13	2½	3 5/16%	Alliance & Dublin Ord.	59—64	48—51	...
574,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Aug. 11	7½	4/–	Bombay, Ltd.	5½—6½	3—3½	61/—62/6
100,000	5	,,	16	4/7½	Bourne- { 5 p.c.	...	7½—8½	...
583,110	10	,,	7	7/–	mouth Gas { B 7 p.c.	15—15½	8½—9½	...
115,000	10	,,	6	6/–	and Water { Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	June 30	—	4%	{ 4 p.c. Deb.	...	54—59	...
992,043	Stk.	July 15	14	56/–	Brentford A Consolid.	261—266	68—71	68½
734,920	,,	,,	11	55/–	Do. B New	204—209	64—67	64½—65
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	58½—59
214,775	,,	Aug. 26	11	10 5/8%	Brighton & Hove Orig.	208—213	115—120	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	82—87	84—85
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	70 5/8
530,000	20	Sept. 29	12½	10%	British	44—45	22—24	22½—23½
120,000	Stk.	June 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	55—58	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	42—45	44—44½
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6½—7½	6½
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½*	...
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—58	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	54—57	56½
360,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	51—54	52
475,000	,,	June 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	44—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—35	...
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	150—155	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	120—125	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	125—135	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6¾—7½	6/15/—6/19/6
16,298,975	Stk.	Aug. 11	4/17/4	46/8	Gas { 4 p.c. Ord.	98—102	50—58	50½—57½
2,600,000	,,	,,	3½	35/–	Light { 3½ p.c. max.	76—79	44—46	44½—45
4,062,235	,,	,,	4	4%	and { 4 p.c. Con. Pref.	96—99	58—60	59—59½
4,674,850	,,	June 15	3	3%	Coke { 3 p.c. Con. Deb.	72½—74½	30—52	51½—52
130,000	,,	Dec. 11	10	10%	{ 10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 14	5	3⅛%	Hastings & St. L. 5 p.c.	...	48—50	...
258,740	,,	,,	3½	2⅛%	Do. 3½ p.c.	87—89	34—36	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5—6	...
86,600	Stk.	Aug. 26	9	9½%	Hornsey 7 p.c.	...	100—105	102½
131,000	,,	July 28	7½	7½%	Ilford A and C	151—154	80—82	80½—81
65,780	,,	,,	6½	5½%	Do. B	115—118	57—59	...
65,500	,,	June 30	4	4%	Do. 4 p.c. Deb.	92—94	54—56	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	130—160	136—141*	135—141
1,235,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	81—83	82½—83
235,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c.	119—121	71—73	72½
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—215	...	...
					{ B.	146—148	...	...
306,085	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,716	,,	Aug. 11	7/5/6	6%	Maidstone 5 p.c.	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb.	...	40—43	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1½—2½	...
250,000	100	Oct. 3	4½	4½%	Met. of { 4½ p.c. Deb.	99—101	88—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd.	11½—12	55—60	...
1,875,892	,,	July 28	4½	3%	Newcastle & Gatsh'dCon.	98½—99½	58—60	...
529,705	,,	June 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	May 12	8	8%	Oriental, Ltd.	117—122	88—93	88½—89
60,000	5	Mar. 26	10	1/–	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	June 30	—	3½%	Plym'th & Stonch'se 5 p.c.	...	64—67	...
60,000	50	Aug. 26	13	60/–	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/–	Do. C	118—121	57—54	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	11/16—13/16	13/—14/–
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	1½—2½	38/—38/9
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	...	42—43	...
346,198	,,	June 30	4	4%	River Plate 4 p.c. Deb.	85—87	42—45	...
150,000	10	Sept. 29	6	6/–	San Paulo { 6 p.c. Pref.	10½—11	6—6½	6½
125,000	50	June 30	5	5%	{ 5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	61—62	...
209,984	,,	,,	10	5%	Do. B	222—224	60—62	...
523,500	,,	,,	10	4 2/9%	Do. C	220—222	59—61	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—11½	7—9*	...
6,609,895	Stk.	July 28	5/4/0	5%	South Met. Ord.	111—113	66—69	66½—68
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	93—95	93½—94
1,895,443	,,	,,	3	3%	Do. 3 p.c. Deb.	73½—74½	48—50	50
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	137—139	88—90	...
1,087,795	,,	Aug. 11	6	5⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	68—70	...
368,837	,,	June 30	5	3%	Do. 5 p.c. Deb. Stk.	116—118	73—76	74
647,740	,,	May 12	7½	5¼%	Southampton Ord.	99—102	55—58	...
121,375	,,	June 30	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.c.	135—138	63—65	...
782,275	,,	,,	6	4½%	District { B 5½ p.c.	115—117	53—55	...
181,255	,,	June 15	4	4%	{ 4 p.c. Deb.	87—89	54—57	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	3%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
256,476	Stk.	Aug. 26	5	3⅛%	Tynemouth 5 p.c. max.	108½—109	66½—68½	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	78—80	...
255,636	,,	,,	6½	51/3	Do. B 5½ p.c.	129—134	59—61	59
108,075	,,	,,	—	46/4½	Do. C	...	55—57	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/–	Wimbledon 5 p.c.	117—122	53—55	—
98,000	,,	,,	6½	50/–	Epsom 5 p.c.	121—126	56—58	...
88,416		June 30	9	3%	5 p.c. Deb. Stk.	66—69	44—47	45

* Ex Div.

South Shields Gas Company.

At a meeting of the South Shields Corporation the Town Clerk reported that the application of the South Shields Gas Company under the Gas Regulation Act for power to charge for thermal units supplied in lieu of per 1000 c.ft., and for the variation of the present standard price of 3s. per 1000 c.ft. (as regards the Boroughs and Urban District) by the substitution therefor of an equivalent price per therm, with an addition to meet increases in the costs and charges since June 30, 1914, and for other purposes, had been heard at the Offices of the Board of Trade before Mr. Honey, the Director of Gas Administration. Mr. Brown, Parliamentary Agent, appeared for the Gas Company, and Mr. Wrottesley, Barrister, for the Corporations of South Shields and Jarrow, and the Urban District Council of Hebburn, instructed by their respective Town Clerks and Clerk, who were present at the inquiry, as was also the Borough Accountant of South Shields. Mr. Currie, the Engineer, and Mr. Pickering, the Secretary, gave evidence on behalf of the Company, and Mr. Herring Consulting Engineer, on behalf of the Local Authorities. According to their amended schedule, the Company claimed to be entitled to a new standard price of 17·1d. per therm, which is equivalent on the present basis of 500 B.Th.U. to 7s. 1½d. per 1000 c.ft., whereas the Local Authorities submitted that a price of 11d. and a fraction was the reasonable and proper standard per therm to be adopted at the present time. The Company's application also included power to increase by 50 p.ct. the charges fixed by their Act of 1904 of 6d., 10d., and 1s. per 1000 c.ft. of gas consumed through a prepayment meter for the hire of gas meter, fittings, and stoves. This addition has been allowed by the Board of Trade in several previous cases. The Board will arrive at a decision, and acquaint the parties in due course.

Bridlington Town Council and the Gas Company.—A report was presented at the meeting of the Bridlington Town Council stating that the Chairman of the Parliamentary Committee and the Town Clerk had attended an inquiry at the Board of Trade offices into the application of the Bridlington Gas Company for, *inter alia*, an increase in the standard price of gas fixed by the Bridlington Gas Act, 1886. The Gas Company's application was fully gone into; and the objections of the Council to the granting of the Order were heard. Alderman J. V. Mainprize said he considered that the Gas Regulations Act, 1920, was never intended to apply to a wealthy company like the Bridlington Gas Company. It was to assist necessitous companies. The whole thing hinged on the cost of production; and while they were not able to convince the Board of Trade that the price should be brought down to the standard previously existing, he believed they succeeded in modifying the position as presented by the Gas Company. The action taken by the Council was wise and necessary; and he thought that instead of the figure mentioned in the Company's application, they would get a much lower price.

Blackpool Corporation.—At a meeting of the Gas Committee, the Gas Manager reported on the requirements of his department for the next three years, and the necessity for making financial provision therefor. The Committee decided that the Finance Committee be recommended to make application to the Ministry of Health for sanction to the borrowing by the Corporation of £53,000 for distribution mains, lamps, meters, and other plant required at the gas-works.

Spenborough Gas-Works Extensions.—At a Spenborough District Council meeting last week, various tenders were approved in respect of gas-works extensions. It was reported that the Unemployment Grants Committee, endorsed by the Ministry of Health, had declined to assist the gas extension scheme, on the ground that it was a scheme necessary for immediate execution irrespective of the need for relieving unemployment. Mr. J. H. Collier (Chairman of the Gas Committee) stated that the total expenditure involved in the linking-up of the three works, consequent on taking over the undertakings at Heckmondwike and Gomersal, would be £12,000; and there were other sums, amounting to about £1000, for connecting-up mains, &c. The total was considerably less than was estimated some time ago.

The Coventry City Council last week adopted a recommendation of the Gas Committee to reduce the scale of charges for gas to large industrial consumers.

The Directors of Meters Ltd. announce that the profits of the Company during the past half year warrant the payment of interim dividends to Sept. 30, on the preference shares at the rate of 5¼ p.ct. per annum and on the ordinary shares at the rate of 5 p.ct. per annum.

The Barrow Town Council have approved a recommendation of the Gas and Water Committee that application be made to the Ministry of Health for their sanction to the borrowing by the Corporation of £34,500, made up as follows: Gas-stoves, £10,400; meters, £8300; and mains and services, £15,800.

At the Wrexham County Court last week, Messrs. Thomas Hughes & Co., contractors, of Wrexham, sued Messrs. A. & L. Crowther, of the Holt Gas-Works, for the value of a supply of outcrop coal, £14 4s. 4d. The question involved in the case was the quality of the coal supplied. Mr. A. Crowther stated that, owing to the inferior quality of the coal, the supply of gas was cut-off for four days. Eventually judgment was given for the plaintiffs for £8 1s. 4d.

An inquest was held at Blackburn on Wm. Withnell, a steel erector in the employ of West's Gas Improvement Company. Medical evidence showed the cause of death to have been concussion and compression of the brain. The firm are engaged erecting vertical retorts at the Corporation gas-works at Greenbank; and while standing on a coke-extractor, deceased, who was alleged to be subject to epileptic fits, is supposed to have had a seizure. He fell a distance of 7 ft., and never regained consciousness. The Coroner returned a verdict of "Accidental death."

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